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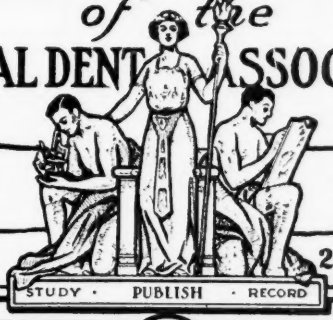

SEPTEMBER, 1919

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—*Frontispieces.*

Gold Foil Operations.—*Ferrier.*

Relative Usefulness of "Fixed" and "Removable" Bridge-work.—*Goslee.*

Root Resection.—*Lyons.*—*Lucas.*

Anatomy—The Foundation.—*Morgan.*

Treatment and Filling of Root-Canals.—*Gethro.*

Peridental Membrane, Cementum and Bone In Tooth Movement.—*Dewey.*

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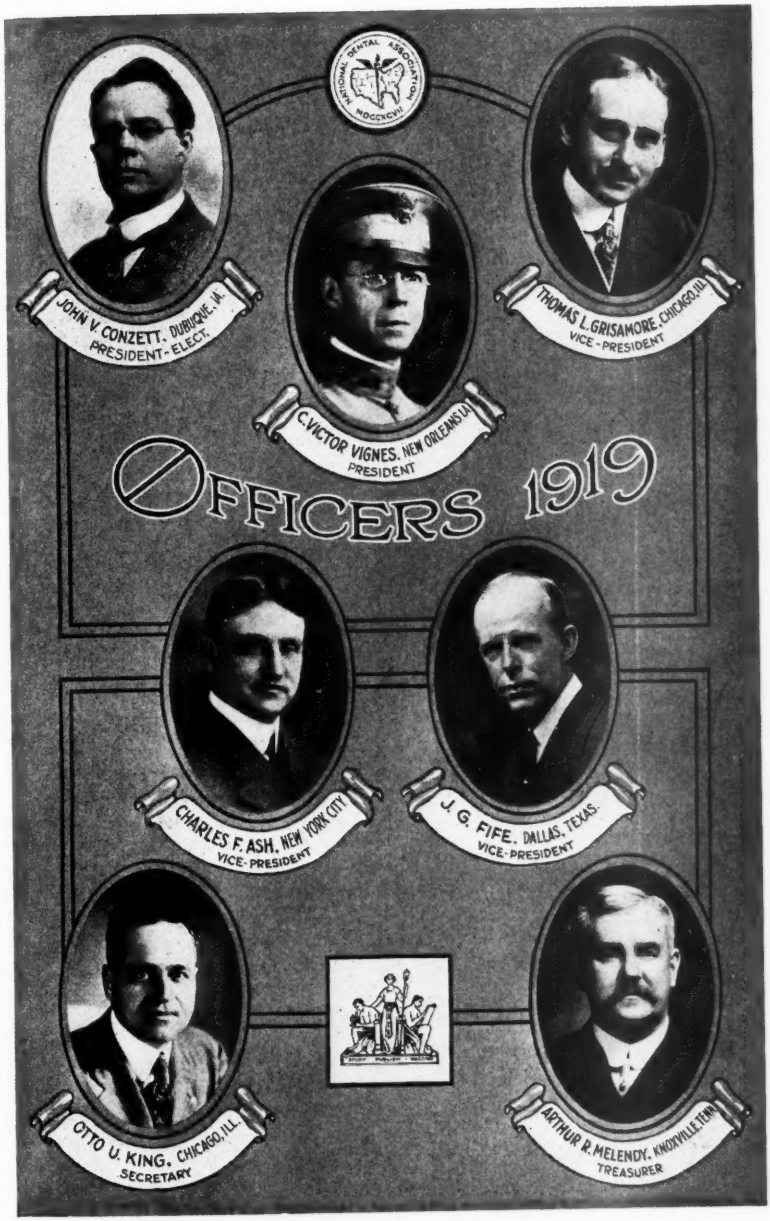
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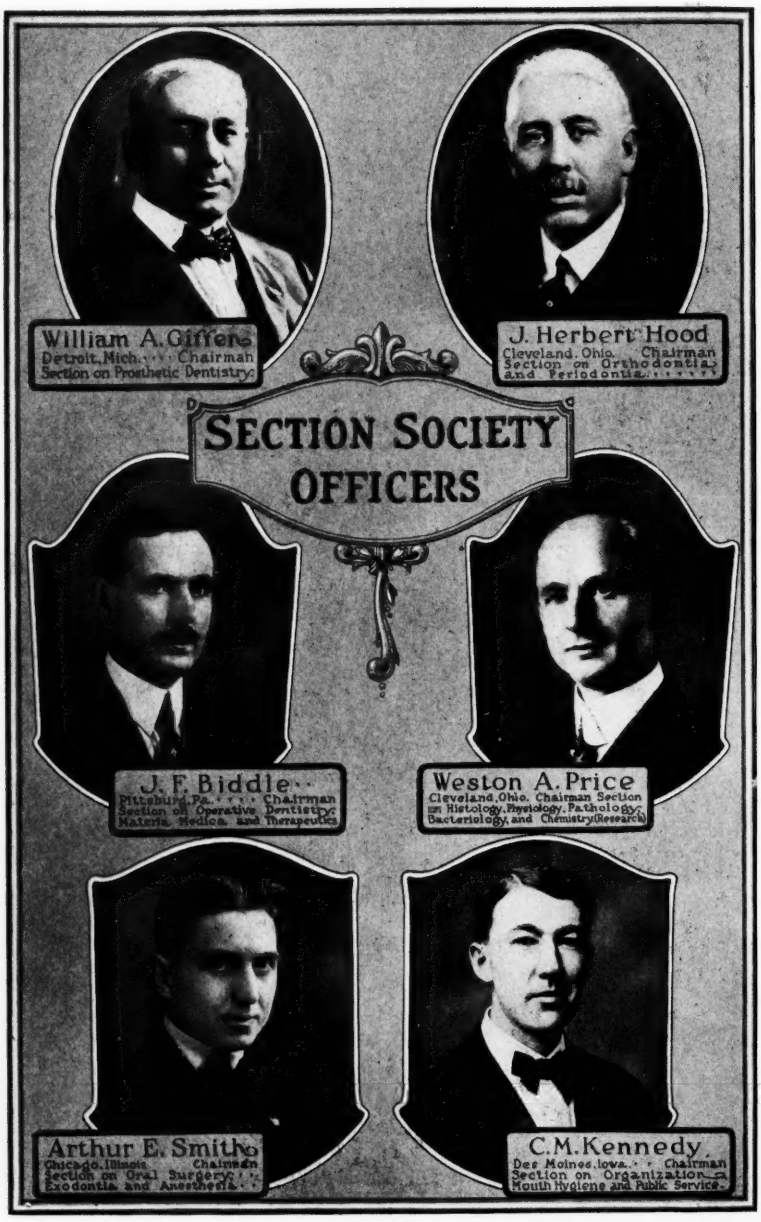
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THE JOURNAL
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Original Communications.

GOLD FOIL OPERATIONS.

By Walden I. Ferrier, D. D. S., Burlington, Wash.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

DENTISTRY, as we know it today, is a highly specialized science, its principal object being to prevent the occurrence of diseased conditions.

Dental disease may be divided into two general classes, those affecting the hard tissues of the mouth, and those affecting the soft tissues. They are so co-related, so inter-dependent, that if decay, the most prevalent of the diseases of the hard tissue, is present in the human mouth, then as a rule, inflammation of the soft tissue ranging from simple gingivitis to pyorrhea alveolaris is also present. If the one is permitted to progress without interference, the other proportionately progresses.

Decay of the teeth is so general that the greater part of our work has to do with its removal and the restoration of the tooth structures lost. Various means have been devised to prevent decay of the tooth structure; a somewhat radical method was advanced and practiced by some of our professional brethren that have long since passed on; it having been observed that decay started most frequently on the proximal surfaces of teeth that were in close contact and that teeth that were slightly separated—were practically immune to decay. What could be more logical then than to separate all the teeth by grinding their proximal surfaces to form 'V' shaped spaces rendering them all immune to decay? I imagine that they were successful in this particular, as most of the teeth were lost thru disease conditions beginning with the soft tissues, before decay had time to progress.

Many modern day practitioners hope to prevent decay by extensive polishing operations upon all the surfaces of the teeth followed by an elaborate system of prophylaxis, too elaborate, I fear to be followed out by the average patient. It is indeed a careful and painstaking individual that can day after day pass a ribbon of floss into a normal inter-proximal space and do no injury to the septal tissue. But we have nothing but commendation for the men past or present who are striving to prevent dental decay —science advances largely by its mis-

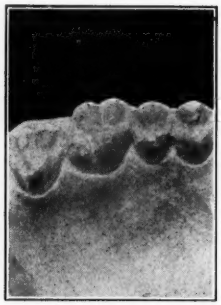


Figure 1.

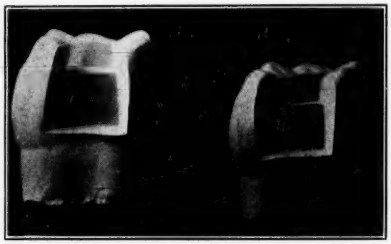
takes—its successes are reached by the stepping stones of its failures.

When Dr. Black, after years of close observation and labor gave us a system whereby we might not only restore the lost tooth structure but restore it in such a manner that those surfaces operated upon would remain immune to further decay, the soft tissues be protected from injury, and the tooth once more become useful and efficient, he then found that gold foil, among the many filling materials not only theoretically but practically, most nearly fulfilled the requirements of making an ideal operation. It is from the standpoint of the prevention of dental disorder that we will discuss gold foil as one of our most valuable agents.

We will describe the making of a gold foil operation in a class two cavity in the mesio-occlusal surface of an upper first molar in some detail, as this class of cavity presents probably more frequently than any other—and serves well to illustrate the technic, and later we will briefly describe the treatment of other classes of cavities.

The cavity form that we will use shows some slight modification to that usually taught in that the buccal and lingual walls of the step are not parallel, but converge toward the occlusal. I can best describe this modification by quoting from a former paper. (Figure 1.)

"The occlusal outline of the tooth—not the cavity—we are operating upon



A. Figure 2. B.

presents the form of a rhomboid, the mesio-lingual angle being obtuse, the mesio-lingual cusp is somewhat rounded toward the occlusal and the lingual cusp of the second bicuspid decidedly curved at the disto-lingual angle. The arrangement of these two teeth therefore, is such that the embrasure opens occlusally as well as lingually, requiring less extension bucco-lingually in the occlusal third of the cavity than in the gingival third, resulting in the buccal and lingual walls, more decidedly the lingual, meeting the gingival wall at an acute angle rather than at a right angle; considerable tooth structure is saved by such a preparation and the principle of extension for prevention is as well served as if the buccal and lingual walls were parallel." (Figures 2-A and B, and 3.)

With this modification, it is presumed

that a proper cavity preparation has been made, as it is impossible to make a good gold foil operation unless painstaking attention has been given to carrying out a detailed cavity preparation, such as has been generally recognized. (See Figure 2-A.)

A quarter cylinder of non-cohesive

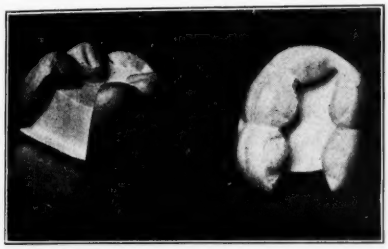


Figure 3.

foil is placed in each the bucco-gingival and linguo-gingival angles and extended or rather flattened along the buccal and lingual walls their entire extent; a quarter cylinder is now placed in each of these angles as before but instead of flattening them along the buccal and lingual walls they are forced toward the bucco-gingivo-axial angle and the lin-

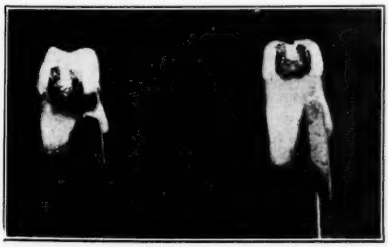


Figure 4.

guo-gingivo-axial angle with the idea of filling these angles en masse. We now place a half cylinder so shaped as to resemble a 'V' with its apex gingivally in between and with a large biangle plugger the entire mass is forced gingivally except the two quarter cylinders that were flattened along the buccal and lingual walls which remain as they were placed. By placing the gold in this manner the entire proximal portion of the cavity is lined with non-cohesive gold adding its property of ease of adaptation to the buccal and lingual walls as well as to the gingival wall. (Figure 4.) Better margins are secured in this manner and time consumed in placing the gold is materially reduced which is not a negligable factor in making gold foil operations. A 1-32 pellet of cohesive foil is now started in the disto-

Figure A.

linguo-pulpal angle and firmly malleted to place with a No. 2 Wedelstaedt plugger; additional pellets are placed and malleted until the mass is securely anchored along the disto-pulpal angle. From this anchorage the foil is built mesially over the pulpo-axial line angle onto the non-cohesive gold already placed, due precaution being taken as to stepping of the plugger and line of force exerted upon the instrument. The gold is driven into all the pulpal and axial line angles in such a manner as to produce diagonal layers. (Figure A.) The line of force being approximately 12 centigrades or 45° to the axial walls, until these walls are completely covered up to the cavo-surface angle when the force can be applied nearly at a perpen-

dicular to the long axis of the tooth until the cavity is completely filled. If you apply the force at a greater angle than 12 centigrades you will probably spring the dentine beyond its elastic limit—fracturing the cusp off or place it under such tension as to cause this disastrous result later when the tooth is put under severe strain in mastication. It is possible for the experienced operator to make a water tight joint using a line of force parallel to the cavity wall. However, this line of force is not recommended except in teeth having fragile walls but it is my opinion

Figure 5.

that in cavities whose walls are at all frail a degree of inclination of the plugger to the cavity walls not to exceed 6 centigrades is ample. I have fractured the lingual cusp of an upper bicuspid when using a line of force not exceeding 12 centigrades. This unhappy result does not often occur and must be charged up to experience.

We will assume that the foil has been placed and we are ready to finish the operation. We should as nearly reproduce the tooth form as found in the mouth in which we are operating as is possible. If you have reproduced the sulci and grooves in malleting your foil you will be able to finish them, and more nearly reproduce them in your finished operation, but if you have had no regard for this important step in placing your foil—it is very doubtful if it will be possible to produce them at all.

A thin Koeber saw is placed in the interproximal space, teeth toward the occlusal pointing buccally; attach the saw frame and cut with a draw stroke occlusally somewhat short of the contact point. (Figure 5.) Detach the frame and remove the saw, follow with the Wedelstaedt files and strips so manipulated as to finish the gingival margin to perfect continuity with the tooth form; apply the Perry separator and tighten to such an extent that a thin bladed Gilbert saw will pass between the teeth. With the Wedelstaedt files and finishing knives trim to as nearly the original proximal tooth form as your knowledge of dental anatomy will permit. Be especially careful to give your contact point a marble-like form, its final finish being produced by the use of a thin cuttle fish strip. By means of stones and finishing burs, especially those of the inverted cone type—the occlusal portion is finished to as near the original tooth form as possible. The final finish is given the step portion of your operation with pumice followed by whiting applied on a Young's rubber polishing wheel and Abott's cleaning brush; remove the separator and the rubber-dam and thoroly syringe the parts with warm saline solution. If you have used care in reproducing your occlusal tooth form, it is rarely necessary to grind the finished operation for occlusion.

To me operating upon class two cavities is the most interesting of all the operations we are called upon to do; it presents so often as incipient caries and its early and careful operation insures lasting results. The tooth is absolutely protected from recurrent caries on that surface—a proper occlusal form restores it to its original efficiency and a well made proximal form protects the septal tissues. (Figures 6, 7 and 8.)

The cavities occurring in the proximal

surface of incisors and cuspids not involving the angle are a never ending source of worry to the conscientious dental practitioner.

Upon casual observation its restoration seems easy of accomplishment—to be sure it is but a simple matter to remove

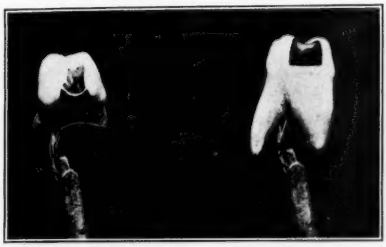


Figure 6.

the labial wall—establish a nice labial outline and mallet gold foil in a cavity occupying the labial ⅔ of the tooth; but what of the fragile lingual wall—what of the linguo-gingivo-cavo surface angle so difficult of access? This lingual wall is usually left standing, and the

Figure 7.

tooth is no more immune to decay than it was before the operation; and indeed this is not all—the objections of the patients to what they believe to be a conspicuous display of gold must be overcome. I have no quarrel with the patient who wishes to have the lost tooth structure in the six anterior teeth reproduced with a filling material that closely approximates the tooth in hue; gold, however, has been used for centuries as an ornament. Is it then quite consistent that its color should meet with such

Figure 8.

strong objection when placed to some useful purpose? But be that as it may we are discussing gold foil from the standpoint of preventive dentistry, not from its artistic or lack of artistic value.

After nearly six years of continuous study club work almost wholly devoted

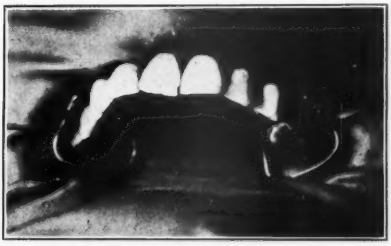


Figure B.

to the manipulation of gold foil—we are practically all of the opinion that this is the most difficult of all the operations to make properly that present. (Figure B.)

The teeth in which these cavities occur are wedge-shaped causing the labial and lingual enamel walls to closely ap-

proximate at the point where we wish to establish our incisal angle leaving so very little dentine to spring and grasp our filling material. The lingual wall, the incisal angle at its lingual aspect,

Figure 9.

the linguo-gingivo cavo-surface angle all are difficult of access and for these reasons we have somewhat modified the usual cavity preparation. The labial outline form presents a straight line the extent of its gingival two thirds to such a point that

Figure 10.

its labio-gingival angle is placed under the free gingiva; on the incisal third presents a curve that meets with this line rather abruptly; the lingual outline form is very similar to the labial and meets the gingival angle at a point under the gum tissue where it will remain immune to future decay. If the gingival wall were cut straight labio-gingivally to meet the labial and lingual walls it would encroach upon the attachment of the peridental membrane, therefore it is curved with its convexity toward the incisal angle—the degree of curvature depending upon the outline of the free gingiva. (Figure 9.) This cavity form greatly simplifies the placing of the foil. A 1-64 pellet of cohesive foil is placed in the linguo-gingivo-axial angle and malleted to place while being held with a starting instrument; successive pieces are placed until the angle is filled up to

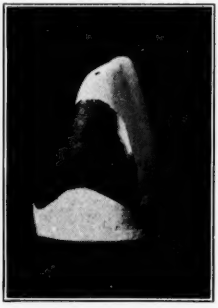


Figure 11.

its cavo-surface bevel. (Figure 10.) This procedure is repeated in the labio-gingival angle and the two united. We now return to the lingual portion of the cavity and build the gold along the axio-lingual angle almost down to the incisal angle using care to keep the foil highest toward the lingual and gingival walls. (Figure 11.) A Perry separator must be applied to gain better access and insure a proper contact point. (Figure C.) It is at this point in your operation that you will appreciate the labial outline form of this cavity, which permits placing your foil almost entirely by mallet force upon a straight or bayonet-shaped plugger—the use of hand pressure alone being rarely necessary. The unfilled

portion of the cavity presents no unusual difficulties.

To finish this operation requires a little more separation—that a thin metal strip may be passed into the interproximal space—this is followed by strips

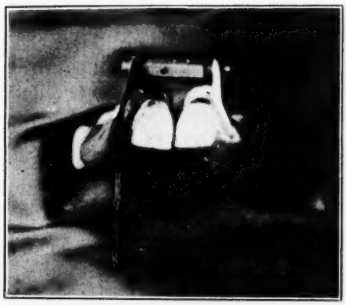


Figure C.

of various grits until hard dense gold is reached to serve as the contact point. Wedelstaedt files and knives are now used to bring the gold down to its margins when the final finish is made with

Figure 12.

strips and discs followed by pumice and whiting. (Figures 12 and 13.)

Class four cavities occurring upon the proximal surface of incisors requiring the removal of the incisal angle are best restored by the "L" filling or Johnson step—too well known to require description. It is well to bear in mind that the gingival wall is curved to follow the gingival line as in class three cavities and that the labial and lingual walls of the step are flared incisally in the direction of the cleavage of the enamel rods.

Figure 13.

This permits the placing of a much larger mass of gold and reduces to a minimum the amount of enamel the gold has to rest upon. (Figure 14.)

In starting the gold the same procedure is used as in class three cavities;

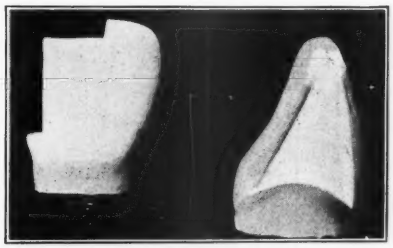


Figure 14.

1-16 pellets of cohesive gold may be malleted toward the axial wall varying the line of force to suit the conditions met until the pulpo-axial line angle is reached. The gold should be highest at this point tapering gradually toward the approximating tooth with which it is in contact. The Perry separator should now be applied and the gold started in

the retention point at the internal third of the step. It has been recommended that in as much as this requires a little more time and patience than any other part of the operation it should be started first assuming that the operator is less

Figure 15.

fatigued and better able to give the gold here the delicate manipulation that it requires. (Figure 15). This is not necessary, I think unless the operation is an unusually large one, moreover meets with the following objection. If a mass

Figure 16.

of gold is malleted to place in a particular part of the cavity and no further attention given it until a larger mass is placed at a distant portion of the cavity —the first mass placed is in danger of becoming contaminated and its surface rendered non-cohesive. It may be argued that the operator might alternate his malleting between the two masses but this does not make for speed and efficiency in placing the foil which, as has been said, is not a negligible factor in making gold foil operations. In the event that we have used the former of the two methods mentioned the gold is built across the step toward the proximal mass already placed and the two united. It is now of prime importance that you change your method of placing the foil; that portion of the filling nearest the approximating tooth requires more building than does the portion occupying the

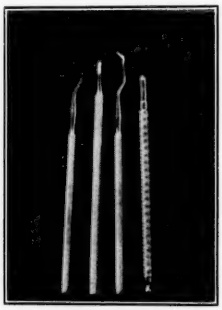


Figure 17.

middle two thirds—it is obvious therefore—that in order to give the operation its maximum strength by laminating the foil over its entire incisal surface that more gold must be added each time to the outer third of the mass than to the internal two thirds. (Figure 16). If this procedure is carried out the gold soon assumes a surface parallel to the incisal surface of the tooth and is carried on to completion using a line of force about 6 centigrades toward the long axis of the tooth. If this is not observed, the last few pieces of gold must be placed upon the extreme mesio or disto-incisal angle, as the case may be, where it is very liable to fracture off under hard usage—due to a lack of lamination of

the foil. The finishing of this operation is accomplished in much the same manner as in class two cavities. (Figure 17). Better access is available, however, and stones and discs can be used to a greater advantage than in the former.

Figure 18.

This class of operation has wonderful strength if properly made and would settle for all time the perplexing question of angle restorations were it not for the esthetic objections met within its use. But I have had occasion to mention elsewhere that if the outline form of the cavity is in complete harmony with the size and the shape of the tooth its appearance is at least not any more displeasing than an angle restoration without the incisal step. (Figure 18).

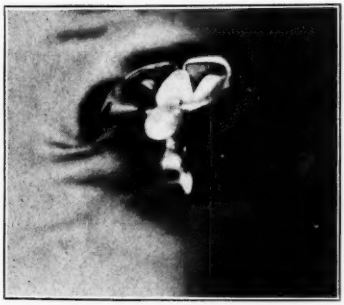


Figure 19.

If gold foil has an indication in any cavity of Black's classification surely it has a place in the restoration of cavities occuring in the gingival third of the buccal and labial surfaces of the teeth. If it is to be used at all as a filling material in connection with preventive dentistry, this is probably its most important indication. You may malign gold foil as being hideously conspicuous in other parts of the tooth if you choose but here where it is at least partially concealed at all times in the vast majority of cases, here where it is productive of such good and lasting results, I have no other choice in teeth that are at all accessible. To be sure there are mouths that present in which rapid progressive

Figure 20.

Figure 21.

caries may contraindicate the use of a filling material other than one that is very easy of manipulation—but in the ordinary cavities of this class *gold foil is king.*

If a rubber-dam is placed without ligatures and a suitable clamp adjusted and secured with modelling compound to the adjacent teeth, you could not ask for a more accessible field of operation in any of the teeth anterior to the molars. (Figure 19). You may use non-cohesive foil alone or non-cohesive in combination with cohesive foil or cohesive foil alone to suit the conditions that pre-

Figure 22.

sent and when your filling is built it has been capable of such close adaptation to the cavity walls and margins and is capable of so high a degree of finish that it will be absolutely non-irritating to the soft tissues and will as surely prevent the recurrence of decay, ordinary prophylactic measures being observed. (Figures 20-21-22). I cannot go into detail in the technic used in making this operation nor can I but by speaking briefly as to the use of gold foil in class one cavities as I have a few more lantern slides to present to you, time will not permit. Cavities occurring in the pits and fissures of the teeth may be filled entirely with cohesive foil, non-cohesive foil or a combination of the two. They offer exceptional opportunity to the beginner in gold foil operating—the technic of placing the gold being rather a simple procedure. (Figures 23 and 24.) I have not touched upon the comparative value of inlays, cements, etc., with gold foil. Volumes have been written upon the subject already. I merely wish to

Figure 23.

bring to your attention a method of operation that requires no speculation as to its lasting results, one that has stood the test of time.

If in the opinion of the operator he can best prevent recurrent caries—protect the soft tissue—restore the tooth to normal function by some method of operation other than a gold foil opera-

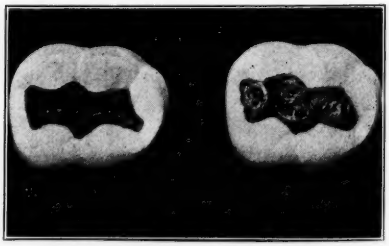


Figure 24.

tion in teeth that present with incipient caries, then it is his duty to use that method of operation; but I firmly believe if he will master the technic of making gold foil operations the vast majority of teeth that present so afflicted will be treated in this manner.

Discussion.

Alfred R. Starr, New York City.

A copy of this paper reached me just as I was leaving for Chicago, but unfortunately the copy I received contains so many typographical errors that it is rather difficult in some places to get the idea the essayist desires to convey. I assume they must be clerical or typographical errors for, to give an example, it hardly seems possible that the essayist would speak, as he does, of the buccal and lingual walls of the "step" when he evidently means to describe the proximate or main portion of the cavity. Again, on page three, according to the text, "gold is started in the disto-linguo-pulpo-axial angle and is securely anchored along the disto-axial angle." I am not familiar with a disto-linguo-pulpo-axial angle in any cavity nor can I locate the disto-axial angle of a mesio-occlusal (or class two) cavity in a superior molar such as the essayist is describing. These were undoubtedly clerical errors and have been corrected in the paper as read.

I do not believe there is an interdependent relationship between caries and diseases of the soft tissues except where cavities extend beneath the gum margin or where proximate cavities allow an accumulation of food between the teeth with consequent pressure on the soft tissues. I am quite sure that pyorrhea has no direct influence in causing caries.

I agree with the essayist that gold foil is one of our most valuable assets as a filling material. There is no other agent which will so well enable us to take advantage of the elasticity of the dentin in securing close adaptation and tight joints. In describing the preparation of a cavity in the mesio-occlusal surface of a superior molar, the argument for making the facial and lingual walls convergent in passing from the gingival to the occlusal is good from only one standpoint—that of conserving tooth structure—but is bad from several others. If prepared as suggested by the essayist we do not have as good access to all parts of the cavity, we are hampered in applying the force of condensation at the proper angle and the occlusal portion of the filling would be less strong and more apt to yield under stress if there were a large bulk of non-cohesive gold underlying it. This tendency to yield under pressure would be better resisted by walls converging toward the gingival or even by parallel walls. It is obvious that by following the plan recommended by Dr. Black we can get better access to the cavity, and the correct line of force in condensation can be better used without requiring undue separation.

A rather far-fetched argument might be to compare the difficulty of properly filling a cavity prepared as the essayist advises, with the difficulty of filling a funnel with a solid or semi-solid material by operating from the smaller end. These class two cavities are well adapted to the combination of non-cohesive and cohesive gold, but in making this combination we must not make the mistake of using too much of the non-cohesive gold especially in cases of strong occlusion. We must also avoid the mistake of having the strip of cohesive gold which unites the occlusal portion of the filling with the proximate too narrow or of insufficient depth. We must have a sufficient bulk of filling, either in width or depth, at that point in order to insure stability. In filling these cavities entirely with cohesive gold we can sometimes get better results at the cervical margin, by thoroly condensing and polishing that portion of the filling as soon as the gold is well anchored or wedged between the lateral walls of the cavity and before the contour is completely restored. Since the

teeth are more narrow at the necks there is more room for the condensation and finishing of the gold at this stage than if we wait until the contour is built out. The combination of non-cohesive and cohesive gold is certainly preferable for most of these cases because of better adaptability and the saving of time but we must endeavor to figure on the amount of stress that filling is liable to be subjected to and modify the proportion between the two kinds of gold accordingly. The essayist speaks of giving the contact point of these fillings a marble-like form, but while this may be the ideal contact from the standpoint of prevention of recurrence of caries it is not ideal from the standpoint of protection for the soft tissues. In bicuspids and molars—particularly between molars—I believe we obtain better results by restoring the natural or normal contour of those teeth which implies a rather broad contact or "area of close approach" in the facio-lingual direction. I have seen bad effects from not following nature's plan in this particular and have seen those bad effects removed or corrected by changing the form of contact to a broader one facio-lingually. In the vertical or axial plane, however, the contact should be narrow and slight rather than broad. I believe the essayist is correct in stating that some of the simple proximate cavities in anterior teeth are much more difficult to fill with gold than are the ordinary complex cavities in posterior teeth. The shape of the teeth, their comparative frailty and the esthetic considerations increase the difficulty in dealing with the incisors. In a cavity of any size involving the proximate surface of an incisor it is difficult to get proper anchorage at the incisal portion without weakening the tooth. In complex cavities in incisors I generally prefer a lingual to an incisal extension, especially if the tooth is thin toward the cutting edge. In such a tooth the lingual extension is to be preferred because it necessitates much less cutting, shows less gold when the filling is completed and makes a filling which is almost as strong as one made with the incisal extension. In a tooth such as we have just described (thin toward the cutting edge), we would have to cut too far toward the gingival to get sufficient anchorage between the facial and lingual walls in making an incisal extension. The incisal extension or "step" is indicated chiefly in cases of tip to tip" occlusion where the dentine is exposed by attrition. In making a lingual extension we must make it as far away from the gingival anchorage as possible without weakening the incisal portion of the tooth. A filling made with a lingual extension is much less conspicuous than one made with the incisal step. From the esthetic standpoint it is well to bear in mind the axiom that if a gold filling in a proximate cavity is to show at all, let it show well, or enough so that it will not be in shadow and appear dark. There is no question in regard to the tendency of patients to prefer silicate cements or porcelain inlays to gold in anterior teeth and we cannot blame them for it. Because gold has been used for centuries for ornamental purposes is no argument for using it in the mouth if other materials will answer our purpose. Some individuals think it beautiful to wear a ring thru the nose or lip or to blacken and file their teeth, but in these times, and in this part of the world, we would not be partial to such methods of decoration. The statement that gold is the most durable filling material for cervico-facial cavities in anterior teeth is undoubtedly correct provided those cavities are not due to erosion and I should say that porcelain inlays, properly made and well fitted, would be next in efficiency.

In closing I cannot do better than to quote from a paper I once wrote on this

subject and say that in this work, as in many other operations the dentist is called upon to perform, we cannot be guided entirely by any set rules or methods of procedure, but must be guided largely by circumstances and the exercise of discriminating judgment. He who cannot rise to the necessities of the occasion and adapt himself to the varying conditions which require the exercise of good judgment and a certain amount of mechanical ingenuity, is poorly fitted for the practice of dentistry. We should be eclectic in our practice and endeavor to cultivate a sense of accuracy in determining what method or methods will be best adapted to any individual case.

Conservatism rather than radicalism would seem to be the dominant factor in the successful preparation and filling of tooth cavities.

James M. Walls, St. Paul, Minn.

It is ever pleasing to hear such expressions of enthusiasm as your essayist evinces for the ideal.

The energy with which he apparently pursues these ideals imparts to one a feeling of supreme satisfaction.

I regret that more time was not afforded by the essayist for the preparation of a discussion, permitting thereby, the preparation of illustrative material which would more adequately present some technical points.

The consideration of prophylaxis must not be with the idea of eliminating caries, but held rather as a means positive in effect of reducing the amount of caries. Thoro as the means employed may be, the eradication of caries is impossible without a complete reversion in habits of living.

The measures referred to in extension of cavity margins to immune areas and which Dr. Black promulgated so fully, is a measure that must always be held clearly in mind by operators.

I can hardly agree with the essayist that a gold foil filling or any other kind of a filling makes that surface of the tooth in which it is placed immune to decay. I will gladly concur in the opinion that reasonable extension of margins beyond contact areas is an essential safeguard against recurrent caries, and that gold as a filling material more adequately fills the requirement for repair of diseased teeth than does any other single filling material.

Simple as the use of foil becomes to one of much experience in its use, it must nevertheless, for both patient and operator, be considered a trying and exhaustive method of filling large cavities. This, however, should not deter us from its use in much of our work of repair. To those not well practiced in its use, gold foil presents a great obstacle to ease of accomplishment.

I am often tempted to consider the introduction of the porcelain cements a great calamity, because of the fact that it has and is cutting down so materially the efficiency for gold foil operations. The lack of ability to handle foil readily makes the selection of other filling materials indiscretely common and results in misfortune for the patient.

While the essayist avoids direct comparison of foil fillings with other methods, his ideas, expressed in the discussion of Class No. 2 cavity preparations suggest comparison and I feel constrained to offer the opinion that many teeth are much more weakened by the cavity preparation for gold foil than they would be by proper inlay preparations.

The consideration of the ultimate health of the pulp should be the one paramount to all others. And the conservation of dentine is of prime importance to protect against pulp irritation and tooth fracture.

Reference has been made to a particular form of cavity preparation on Class No. 2 cases, in which the essayist suggests the cutting of these cavities to such

a form as would present in the occlusal area a cavity broader linguo-buccally at the pulpal wall than it is at the orifice

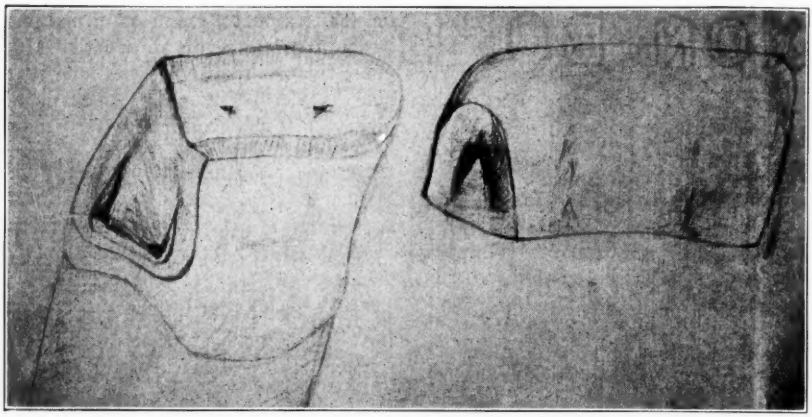


Figure 1.

or cavo-surface angle. Slight divergence of the axial surface toward the pulpal wall would present no difficulties, providing the marginal bevel was well carried out for access and precaution against marginal injury from the plugger.

This outline has the advantage of definite retention form but requires a possible removal of more dentine than may be necessary.

In respect to the proximal outline, the convergence of the lingual and buccal surfaces toward the occlusal would of necessity be very limited, otherwise difficulty of procedure from lack of access would result. A slight divergence of these surfaces toward the gingival has the advantage suggested by the essayist

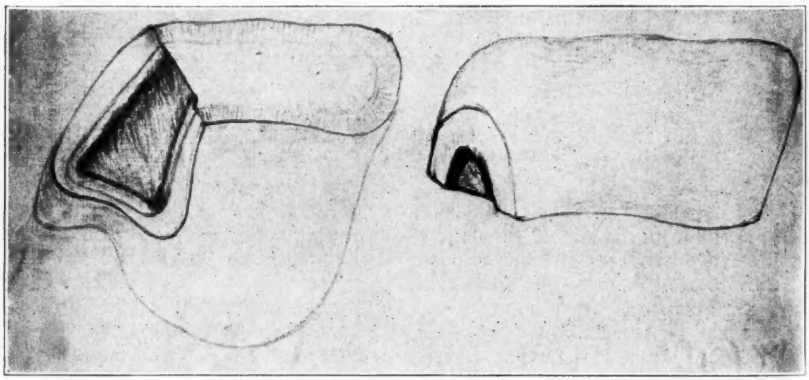


Figure 2.

and also that of retention against occlusal movement, but it reduces very materially, accessibility.

There is a distinct factor in these cavity preparations that must be foremost in the minds of all making them, which is

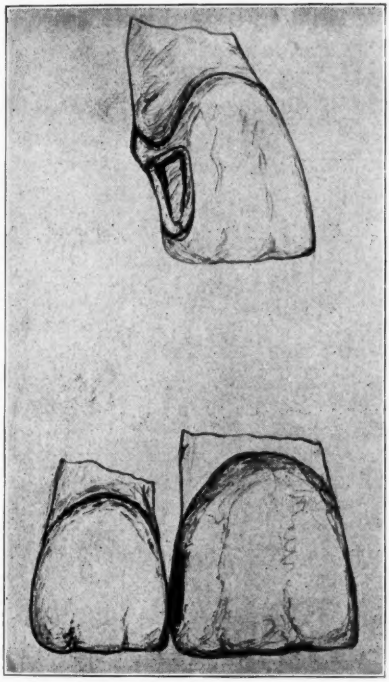


Figure 3.

that the broader the extension bucco lingually at the gingival and the deeper the extension gingivally, the greater geometrically do we weaken the cusps of teeth.

This is a signal condition in cases of cavities occurring on both the mesial and distal surfaces of bicuspids or molars and recognition of the liability of occurrence of caries on the opposite side of the tooth; where at present only one side is affected, must be considered in our procedure.

The suggested technic of employing non-cohesive foil and of placing it, is ideal in such cavities and should, it seems to me, be mastered by all operators on account of its many features of advantage.

In the consideration of cohesive foil in these cavities I cannot agree with the essayist that a twelve centigrade angle is the most desirable for condensing the gold against the axial surfaces. The

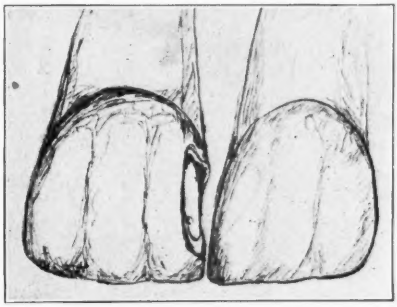


Figure 4.

wedging or indirect method of condensing gold against a surface is always more delicate and positive. This can be much better accomplished in my opinion by holding the plugger to form an angle with the axial wall of five or six centigrades.

A plugger with a straight shank and a face beveled to about 86 centigrades permits the application of the inclined plane and avoids duplicity of instruments.

The proper form of restoration referred to calls for full commendation. Only by such attention to outlines can we hope to secure in a large measure, the ideal in utility. The proximal surface should not, however, be so uniformly convex as to present a marble-like outline. Too

narrow a contact point, or rather let us say surface, does not protect the interproximal space against food impaction. The outline form should be more nearly that of the flattened portion of a sphere which has been somewhat compressed.

The occlusal surface should present grooves and ridges to correspond with the opposing tooth, if we are to restore function.

Figure 5.

First position of plugger, small round or parolelograuss indicated. Nos. 2 and 3.

Figure 6.

Second position of plugger. Same instruments as Figure 3.

Considering the occlusal surface we find the marginal ridge occupying the position of an obstruction to food passing between the teeth.

There are some who claim that marginal ridges should not be established on account of strain induced upon the already weakened tooth.

I maintain that a marginal ridge should always be established and the relief from strain be taken care of by exaggerating, if necessary, Nature's method of relief and cutting more pronounced grooves across the ridge to the buccal and especially toward the lingual. This not only provides a gateway for the food to pass out of the occlusal sulci, but directs its movement, thus diverting it from the embrasure.

This is made just as a sluice-way is built by an engineer to divert snow, shifting earth or water and avoid disastrous pressure.

In consideration of cavities of the front teeth, the essayist has well suggested the use of gold foil as the material best adapted for general use in preserving the health of teeth and gum tissue. Further consideration of these will be later considered.

Particular emphasis is called to the use of files for dressing down fillings, but the selection of a pattern for these should be such as to secure instruments that are thin thruout and have edges of delicate proportions. By the use of such instruments great conservation of

time and exactness of form can be secured. They not only cut rapidly but have the advantage of doing the work with less discomfort to the patient than strips or discs.

They also drag and burnish the gold, giving it a better and more even surface condensation if possible, than is obtained without them.

In the extension of cavities beneath the gum margin, reference was probably made with the idea in mind of what would maintain in case of youth, where the gum fills the entire septum to the contact surface.

It is necessary to extend gingival walls well away from contact areas, but in cases of adults, an extension to a line beneath the gum would in many cases be inexpedient.

The essayist has with precision outlined a technic for preparing proximal cavities in the front teeth and refers to them as the most difficult type in which to secure perfect results with gold foil.

Accepting the outline in general as suggested for these cavities and considering for definition, cases where little waste of tooth thru decay has occurred, there seems to me to be several salient points still worthy of mention for producing simplicity in procedure.

Figure 1. First the junction between the gingival and the lingual walls should present a short curve with the surface forming it directed toward the labial and incisal, thus giving a definite wall to build against by direct access. The margin will be carried (Figure 2) well away from proximity to the adjoining tooth, and be covered by gold in the initial stage of construction.

Figure 3. At the incisal the retention form must be positive and directed toward the incisal and labial. Opening up the incisal portion of the cavity as recommended by the straight labial margin and a (Figure 4) short curve at the incisal, permits proper retention form making an access for proper filling in this area. One feature that I should like to see emphasized and which is extremely important, is the beveling of the incisal margin; that surface which links the lingual and labial surfaces.

The labial outline should extend slightly farther toward the incisal than does the lingual, giving us thereby a

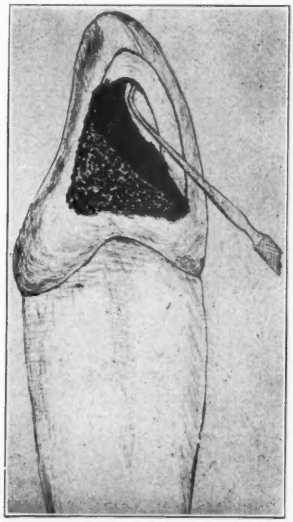


Figure 7.

surface (the incisal) which faces the gingival and slightly to the labial. This will permit perfect access for packing gold by direct force against its lingual portion.

The labial outline of the cavity will be a little larger only than the lingual, the margin of which properly beveled to protect against weak enamel may be readily covered from labial access, requiring little gold to be added from the lingual direction.

The method referred to by the essayist for filling retention points calls for some discussion. I can see only a dis-

advantage in starting gold separately at the different retention points.

Figure 5. Ease of work and conservation of time forbids the starting of as many gold fillings as there are retention points in the cavity. (Figure 6.) It is simpler and much quicker to start the gold in one angle, preferably the linguo-gingivo-axial and proceeding from that (Figure 7) build to the termination of the filling.

This method is applicable to cavities involving the incisal surface also.

Figure 8. In this latter case of cavities the use of sheet gold folded and cut into ribbons of suitable width often facilitates incisal building.

By such measures for shaping cavities and constructing fillings of gold foil, there will be little to regret in after years when time has proven the test of method. And in this day of distraction from the gold foil operations, and when it would seem most of the profession are sedulously avoiding this type of procedure for making restorations, it is particularly pleasing to have presented a paper which shows the fervor and enthusiasm for the ideal as the one which was presented to us.

And it is hoped that such expressions of endeavor in operative dentistry will stimulate many who are looking askance at gold foil, to renew its acquaintance.

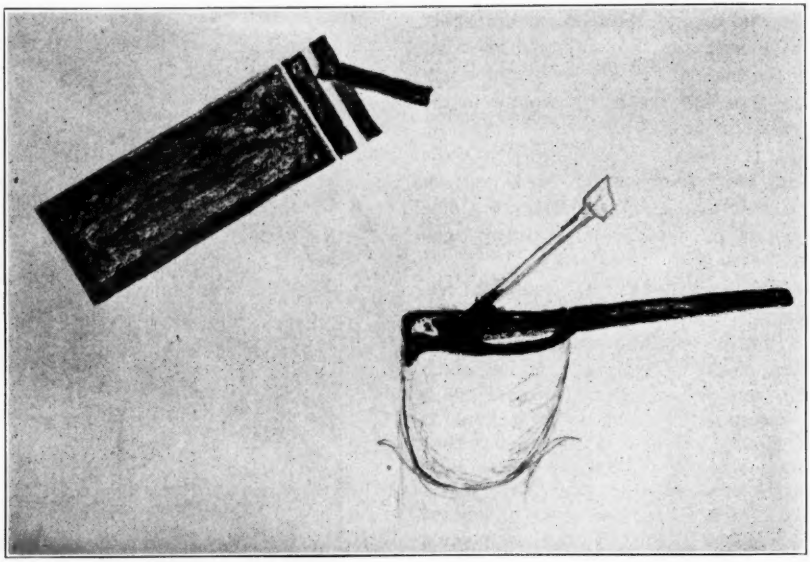


Figure 8.

McCollum, Los Angeles, Calif.

Is dentistry as we know it today a highly specialized science? Is dentistry as we know it today a science at all? Isn't it only a very much undeveloped art and not very artistic at that? What could be more reasonable than to expect a man doing gold foil operations well, to look upon dentistry as a highly specialized science? About all there is of science in dentistry is wrapped up in

that one phase of it: the gold foil operation. No other part of our work has been so thoroly developed. It should be the pride and joy of every dentist to master the technic so scientifically marked out and so ably demonstrated by Dr. E. K. Wedelstaedt. A tooth so treated becomes a lasting testimony to the efficiency of the operation.

The essayist with some slight emphasis dismisses the subject of cavity preparation. It is true his subject deals with the placing of gold foil. But too much stress cannot be placed on the necessity for proper preparation. Cavity or tooth preparation is the very essence to every dental restoration, whether it be gold foil, plastic material or crown. Practically all failures can be traced to faulty preparation; preparation so faulty that a successful operation was impossible. So important is this part of the work that harsh words are justifiable to drive the truth home. I leave these few for your consideration. A well known dental salesman said twenty-one very prominent dentists prepared each a technic tooth for a restoration, not one of which was so prepared as to admit of the possibility of a successful operation. If you think you can prepare cavities in teeth, try it on an extracted tooth. After you have tried it maybe you will partly understand why we are constantly tearing out the other fellow's work. We have up to date worked for only about ten per cent of the people. Let's shuffle the cards and quit dealing the same cases over and over again. Let's give the submerged 90 per cent a chance. When those twenty-one prominent dentists, and I leave it to you to say how many others, learn the art and science of preparation, then, and not until then, will dentistry take its place among the learned professions.

Good old gold foil, "God bless it," stands for no foolishness. You master cavity preparation in detail and its manipulation or gold foil is not for you. Its requirements are exacting in every detail, but not irksome to the man who wants to do things right. With the mastery of the gold foil technic goes the desire to develop fully the ability to restore tooth form and function in all its phases.

Just why gold foil operators as a class fight shy of and fail to develop the technic of an operation which if given the same careful consideration as the gold foil operation offers possibilities almost unlimited is hardly understandable. Where a gold foil operation is indicated it stands without a superior. No other operation is better, so comparisons are futile. But dentistry requires of us today the restoration of badly broken down teeth, and the replacement of lost members using something in or on remaining teeth as abutments. For such a purpose gold foil is not available.

Unlike gold foil the cast gold inlay admits of almost unlimited abuse. Its *use* up to date has consisted mostly of *abuse,* principally because no definite attention has been paid to cavity preparation. The greater portion of so-called inlays are not inlays at all, simply *onlays,*—unsuccessful efforts to *shingle* a tooth with gold. When the cast gold inlay operator studies cavity preparation with G. V. Black, following in careful detail all the requirements of stress resistance, extension for prevention, mechanical lock, etc., he will have what is required for the making of a cast gold operation that is a true inlay; just as the gold foil operation is an inlay. To inlay means to lay within or insert in something.

When the cast gold inlay is developed for just what it is and all thought of making the operation *easy* is banished from our midst, it stands a chance of coming into his own. *The technic of the*

cast gold inlay is exacting but not irksome to the man who wants to do things right. Crandall has demonstrated that an amalgam operation done well requires careful cavity preparation and outlines a technic that wouldn't suit "Sloppy Susan" a little bit. In fact, he has demonstrated that amalgam done well requires so much time and care that a more worthy material should receive that attention.

The essayist has made it plain that his paper is not a discussion of the relative merits of dental operations. I hope to make plain my belief in the unsurpassed merits of the gold foil operation and that what I have said in regard to the cast gold inlay is not a comparison of merit. What has been said is simply an effort to draw the attention of a class of skillful operators to an operation which will when fully developed offer possibilities far beyond any means at our command today.

In its place the porcelain jacket or veneer crown operation stands supreme. The gold foil operation has no superior. The plastics fill their niche. But in any condition where a dental restoration is to be made it would be possible (understand me, not desirable,) always to restore the parts to function with a cast gold operation. In other words, we could practice desirable restorative dentistry, (fill cavities, replace missing teeth, etc.,) using nothing else but the casting process. No other means offers such unlimited usefulness. Isn't it high time we developed an operation offering such unlimited possibilities?

In spite of the fact that most of the things we hear about inlays are efforts to show how easily and quickly it can be done, I am not yet convinced that the profession is always looking for the "easiest way." I hope to live to see the day when the cast gold inlay operation will be as thoroly and as concisely outlined as the technic for Gold Foil is given in this good paper.

A CONSIDERATION OF THE RELATIVE USEFULNESS OF "FIXED" AND "REMOVABLE" BRIDGE-WORK.

By Hart J. Goslee, B. S., D. D. S., Chicago, Illinois.

(Read before the Chicago Dental Society, April, 1919.)

HOWEVER much or little consideration may have been given to the teeth of mammal thruout all the ages, their functional importance is now becoming fully and generally recognized, and while the growth of this recognition may have been slow, it has nevertheless been gradual and certain.

Hence, dentistry, as a preventive measure, and as an important specialty of the healing art, while yet perhaps only in its infancy, and far from being a definite science, and whilst its practice may still be clothed in empiricism, is fundamentally the outgrowth of necessity, and therefore no longer to be regarded as a luxury.

The wonderful and mystifying ingenuity of the Creator placed teeth in the mouths of mammal for a definite and specific purpose, and so designed and arranged them, originally, as to fully meet all of the requirements of the part which they were to play in life and in health.

Had the mammal hewn closely to the mode of life originally intended, it is probable that the science and art of dentistry might have remained unknown and unheard of in the scheme of life, but since, in the evolution of the specie, the influences of habit and environment have produced or brought about a continuous series of progressive changes, the teeth have not been immune to those variations and susceptibilities which result in disease, deterioration, disintegration and impaired or lost function.

In the original plan it is evident that a full complement of teeth was regarded as being essential to health and to longevity, and that such was designed and intended to endure. But, as a result of these influences, this wonderful mechanism has likewise become subject to all of the destructive processes which devastate and undermine *health*, and in consequence premature loss, in part or in whole, not infrequently follows.

A premature loss of any one single unit in the mechanism of the masticatory apparatus must be recognized as meaning or at least inviting, impaired function to a greater or less extent, and as impaired function increases in direct proportion to the number of units thus lost, the requirements of health and of efficiency will demand, and can only obtain from, a replacement of the missing units, in part or in whole, until the coefficient and maximum of normal functional activity shall have been restored.

It is therefore apparent that the loss of natural teeth, whether this loss may be premature or whether it may result from the ravages of time and usage, is a serious matter, and that in all efforts directed toward the promotion and safeguarding of health two highly important considerations present to the dentist: *First*, the conservation of the teeth; and, *second*, their replacement when lost.

With regard to conservation, permit me to say, first, and will all of the emphasis at my command, that every

single natural tooth possesses an intrinsic value in, and to, the human economy, which far exceeds any possible value of an artificial substitute of whatever kind or type, or however skilfully it may be made or applied.

Hence, it is and must always be the first duty of the dentist to save the natural teeth, and in so far as it may be possible to so teach and inculcate in the mind of his patient the signal thought that no effort on his part, or no effort within the scope of his artistic possibilities, will ever enable him to improve upon normal conditions, or to furnish substitutes which will in every way take the place and do the work of the natural teeth.

But until this is more keenly recognized teeth will be lost, and so long as teeth are lost, they must be replaced, and when they must be replaced, the second duty of the dentist must necessarily be to effect their replacement in the best possible manner.

While it is true that the early efforts in the replacement of lost teeth were probably made more particularly for the purpose of relieving disfigurement, with its attending embarrassment, yet a recognition of the importance of also, and at the same time, restoring usefulness and efficiency soon followed, and for both purposes combined a demand, growing and increasing with time, resulted in the advent of the mechanical or prosthetic aspect of modern dentistry, and later of what is now designated as the specialty of crown and bridge-work.

Prior to the advent of this specialty, missing teeth were supplied by means of partial dentures, made, first, by swaging a base of gold or of silver, and attaching the teeth to it by soldering. Later, vulcanite rubber was introduced, and because of the greater simplicity and economy involved, its use soon practically supplanted metal bases, and became the general practice.

In the absence of a better method, this means of supplying missing teeth served the purpose, and was for many years, and is still, a more or less satisfactory procedure. Indeed, had such a practice continued, it is probable that many thousands of good, sound natural teeth, long since lost, would still be doing good service.

And yet, apparently satisfactory as was this method, in the main, and irrespective of the fact that no product of art can ever entirely and completely take the place of nature, objectionable features were observed.

The free mobility and easy displacement of such fixtures did not afford great efficiency, and hence they served the purpose of cosmetics rather than the requirements of actual usefulness, and a greater or less degree of injury to the necks of the remaining natural teeth, and the contiguous tissues, as a result of contact and attrition was noticeable.

While viewed more or less lightly by both dentist and patient for many years, these objectionable features were nevertheless well founded. They were well founded for the reason that just in proportion as the body of the sustaining fixture which supplies missing teeth is easily movable, is the actual masticatory efficiency of the artificial substitutes correspondingly decreased; and, also, just in proportion as the fixture is supported entirely by the soft tissues upon which it rests, will some degree of resorption of these tissues be constantly stimulated, and will the contact of the base with the necks of the remaining natural teeth prove a source of greater or less and of increasing injury to the health and life of these teeth.

Hence, it is not at all surprising that some effort to overcome these objections, and to improve upon this method, should follow, and such an effort resulted in, and marked the advent of, that mode of procedure which is now designated as "fixed" bridge-work.

The replacement of missing teeth in a

fixed manner seemed at once to afford relief from these objectionable features, and therefore to mark the advent of a new era in constructive procedures, and as a result fixed bridge-work has been recognized by leading teachers, authors and practitioners as a sane and useful, tho much abused, practice now for more than two generations.

In the original conception and application of fixed bridge-work, however, the practice was limited to supplying but a single missing tooth by means of attaching it securely to one or more adjacent natural teeth, and as this simple procedure seemed to afford and insure success and permanency to a marked degree, the replacement of a greater number of missing teeth by the same means, and in the same manner, soon, and perhaps quite naturally, followed.

And as the possible advantages to be thus obtained were recognized by both dentist and patient, the practice of fixed bridge-work became more and more popular, and more and more general, and in proportion as it seemed to be a successful procedure in small cases, it increased in popularity and in general usefulness.

In the same proportion, also, increased the courage of the dentist and the demands of the patient, until caution and precaution, reason and logic, mechanics and physics, and until any consideration of the physiology and pathology mayhap involved, and of the laws of hygiene and sanitation, and of health and disease, were either grossly abused or entirely ignored.

And thus the number of missing teeth which might be replaced in this manner increased from *one* to a *full complement*, and the practice of fixed bridge-work became more and more general, until finally the construction of a fixture which involved and included all of the teeth in the arch was looked upon by the enthusiastic prosthodontist as his greatest operative achievement, and as an accomplishment which marked him as a skilled specialist in a wonderfully fertile field of human endeavor. And the patient, thus made a martyr to the brilliant evidence of the art and genius of the master, would proudly and unblushingly exhibit a masterpiece of "teeth without plates."

But in proportion as the missing teeth thus supplied increased in number, it was soon observed that the proportion of failures also increased, and that the life of the fixture became of doubtful, or precarious, duration in the same ratio. Also, that mouths which had been so beautifully reconstructed were not often found to be healthy, and that when failure did occur, it was to be attributed in large measure to the fact that the supporting teeth, tired of their heroic struggle against the ravages of time and the burden of unnatural and unreasonable stress, finally succumbed and were easily removed, often still clinging fondly to their securely attached and perhaps beautifully made appendages.

No irony or facetious sophistry is intended, but thus and for these reasons the thought of "septic dentistry" was born, with *fixed bridge-work* as the parent to the thought, and a growing, vigorous, and sometimes vicious condemnation of fixed bridge-work, together with equally vehement demands for *removable* structures, has followed as a heritage.

While much of this condemnation has been justly warranted, for the reasons mentioned, still, in these days of advanced thought along the lines of preventive medicine and dentistry, certainly no one would or could fail to recognize the true value and importance of the laws of hygiene and sanitation, or of any means which will in any way contribute to the conservation of health and efficiency, and therefore any method or any

practice which may produce or even invite a septic condition *should be* vigorously and religiously condemned. But is the failure of a large percentage of fixed bridge-work to subscribe to these laws due to a wrong principle, rather than to a faulty or injudicious application of a good and perhaps useful principle?

At the present time this question is agitating the profession to a considerable extent, and is one demanding our most careful and conscientious thought, for the reason that if fixed bridge-work is wrong in principle, and if its use necessarily means septic dentistry, then it must be abandoned as a practice; but if fixation is not altogether wrong in principle, and if a septic condition need not necessarily follow, then a place of usefulness in our practice must be accorded to it.

Readily granting that a large percentage of fixed bridge-work has been a failure from both physical and sanitary viewpoints; that much of this character of work which has not already failed perhaps will yet fail, and that many good, sound teeth have been lost, and perhaps will continue to be lost, as a result of its use, should it be universally condemned, or should effort be made to ascertain and, if possible, to overcome the cause of these failures?

From a physical viewpoint, it must be acknowledged that a very large proportion of all failures recorded has resulted from imposing too much undue and unnatural stress upon the supporting teeth. This is proven by the fact that smaller bridges have generally been more successful than larger ones, from the very beginning; but, granting that the permanency of the fixture is reduced by increasing its size, does it follow that fixation as a principle should be condemned?

It is also interesting to note that a large proportion of the failures from the viewpoint of sanitation are to be found in the larger structures, but does this prove that ample and adequate sanitation may not be provided for in smaller fixtures? For the same reasons, should the septic contents of unfilled root-canals condemn the principles underlying the superstructure supported by teeth so treated, or mistreated; and will the presence of a fixed bridge induce or invite a condition of sepsis any more quickly or certainly than will an overhanging, unfinished cervical margin of a metal filling, or the edge of a poorly adapted artificial crown, or any other form of mechanical irritation?

In view of the fact that nature will not tolerate any form of irritation of a permanent character; that imperfect and faulty adaptation will produce irritation, with its sequela; and that such a condition may result from any one of many kinds of dental operations, is it fair to single out and shoulder the responsibilities for septic dentistry upon fixed bridge-work alone, or, at least, upon the underlying principle involved, rather than upon the possible devastating influences of injudicious application, or of faulty technic? I think not. Hence, notwithstanding the crusade of condemnation against the use of fixed bridge-work which has been prosecuted so vigorously ever since Hunter first called our attention to the frequent presence and undermining influence of septic dentistry, by the advocates of removable bridge-work; and, notwithstanding the fantastic claims made by some of these advocates, is it not possible, therefore, that there may still be a place for fixed bridge-work, and that it may possess some virtues and qualities which warrant its use, in certain cases, and under certain conditions?

And, further, whether a greater number of good, sound natural teeth have been lost by and thru the use and abuse of fixed bridge-work during all of

the years since its introduction than have been lost by the misapplication, or failure, of various attachments for sustaining removable structures in proportion; or than have been purposely sacrificed in the past few years by the over-enthusiastic followers of the foci of infection theory, is another question of debatable significance.

But be this as it may, the dentist of today is confronted with the fact that teeth are lost, and that when they are lost in order that function may be restored, health may be conserved, disfigurement may be relieved, and premature old age may be prevented, they must be replaced, and while it is admitted that no method of replacement will ever offer or afford a perfect restoration of the normal condition originally presenting, still an effort to obtain the greatest possible degree of usefulness, of comfort, of permanency, and of health, with the least possible injury to the remaining teeth and contiguous tissues should always be observed in their replacement.

With this signal thought in mind, and in justice to an honest conviction which is the product and result of experience and observation, I am compelled to believe that the principle of fixation, while not carrying out nature's original intentions, when properly and judiciously applied, is not altogether wrong; that septic conditions are not necessarily analogous to this particular method of supplying missing teeth, and that, in accomplishing the requirements of replacement and restoration to the highest degree, at least two important advantages may be obtained from the use of fixed bridge-work.

In the normal denture actual masticatory efficiency depends largely upon the stability of the teeth, and while each tooth possesses a slight range of mobility, due to the cushion-like action and elasticity of the pericemental tissues, that mobility is always and only in line with the direction in which stress is received, but resistance to the stress of mastication is provided for by a close contact between the crowns of the teeth, and by their roots being surrounded with bone, both of which so stabilize them as to offer resistance to stress in proportion to their functional requirements.

This same stability in artificial teeth likewise increases their efficiency and usefulness, and this constitutes the first, and perhaps principal, advantage to be obtained from the use of fixed bridge-work.

And, secondly, the secure fixation of the supporting natural teeth, the stability and integrity of which may have become impaired because of the loss of contact, and of their tendency to gravitate, by means of a fixed structure, may often add increased stability, usefulness and longevity to such remaining natural teeth.

Were it not for these very important advantages, and were it not for the fact that small fixed bridges may be so constructed as to be kept as reasonably sanitary as it may be possible to keep the natural teeth, then the advocates of removable bridge-work, who claim that there is absolutely no place in dentistry for fixed bridge-work, would occupy a more reasonable and tenable position in the premises.

While many of the claims made for the advantages of removable structures are anatomically and physiologically sound, yet some of them are so radical that they are valueless, because no one line of mechanical procedure, no one system, no one method, or no one's individual ideas are so broad and comprehensive as to be universally applicable alike to all of the varying conditions which present in the treatment of normal and abnormal cases requiring the replacement of teeth.

For example, it is broadly claimed that since the natural teeth move in function, any fixed appliance which will in any way prevent this movement is

malpractice. That the teeth move in function has always been known. They always did, and always will, and no form or type of appliance, either fixed or removable, will overcome or prevent it.

It is true that when a fixed appliance involves teeth of different functional activities, such as the incisors, biscuspids and molars, that the normal individual movements are undoubtedly diminished, but whether to such an extent as would so interfere with the nourishment of the tooth as to cause its ultimate death and subsequent loss, or not, is doubtful.

In this connection, many teeth have undoubtedly been subjected to irreparable injury, and perhaps lost, thru the application of a fixed bridge, in which the principle of fixation itself was in no way responsible. This may come from the forcing to place of a structure which, because of a contraction or warpage taking place in the final assemblage of the parts, so draws or forces the roots of the supporting teeth into an abnormal position as to produce a degree of impingement upon the pericemental tissues, which ultimately results in stasis and death of these tissues. This is not an infrequent occurrence, and only one of many causes for failures which may result from the application of a fixture otherwise perfectly constructed, and which prove that faulty technic may be a factor in the failure of fixed structures quite as often as the failure may be attributed to wrong principle.

While faulty technic may also be the cause of many failures in removable bridge-work, yet by far the greater proportion occur as the result of the influences of misapplied leverage. These influences, however, are equally as injurious to the health and life and usefulness of teeth, irrespective of whether they support fixed or removable structures, and in the application of each, every effort to avoid, or at least to minimize, not only abnormal vertical stress, but the influences of leverage as well, must be observed.

Hence, in fixed work no tooth used as an abutment must be permitted to become a lever, entirely unsupported and unprotected against the influences of abnormal stress, and in removable work the attachment to every tooth used as an abutment must be confined as nearly as possible within the periphery of the tooth for the same reason.

If these are recognized as the principal factors upon which the success of our work will depend, and if they are observed, then there must be a place for both fixed and removable bridge-work.

In fixed bridge-work the aim must be, therefore, to avoid or minimize unreasonably excessive abnormal stress; to group together as nearly as possible only teeth which have similar functional activities; to make an attachment to them which will insure sufficient integrity to withstand the stress imposed, and to make ample provision for the requirements of sanitation. When these combined factors may be correctly and favorable observed, then there is a place for fixed bridge-work, then its use is indicated, and then nothing will take its place and serve the purpose quite so well.

But when all of these requirements may not be observed, or may not be possible, then fixation is contraindicated, and a removable type of structure is demanded.

Realizing that my views would deal largely and more particularly with the practical side of this question, and desiring that the truly scientific aspect of the subject should also receive the consideration which its importance demands, I have asked that student of biology, and that mechanical genius, Dr. Calvin S. Case to supplement my views with his own ideas as to the physiology, possible pathology and mechanics involved in the application of fixed bridge-work. This he has done in the form of

a personal letter to me, which, because of its scientific value, I am now pleased to read:

Dr. Hart J. Goslee,
Chicago, Ill.

My dear Hart: The special phase of the subject of crown and bridge dentures of which you have asked me to give my opinion from a mechanical and physiologic standpoint, refers particularly to the relative movements of the abutment roots in their sockets under the forces of mastication, etc., and the influences which these movements exert toward breaking down the integrity and ultimate permanency of fixed bridge dentures.

In a consideration of this branch of the subject, it would be well to consider first the character and magnitude of the masticating forces which cause the normal movements of the roots of teeth in their sockets, permitted by the cushion-like elastic membranes which surround the roots and intervene between them and the walls of the alveoli, and whose function is doubtless partly to prevent the severe shocks of mastication, etc., from injuring the highly organized dental and pericemental membranes which are necessary for the nutrition and vitality of the teeth.

When we remember the exhaustive demonstration by Dr. G. V. Black showing the degree of force exerted by the jaws in mastication, (1) in direct pressure upon the teeth, and (2) against inclined facets of the cusps, and (3) in lateral raking movements of the mandible, we can begin to understand and appreciate the irresistible magnitude of these forces under which the teeth are so continuously subjected, with the production of almost every direction of root movement.

In regard to the need or absolute necessity of these movements from a physiologic standpoint for preserving the health and normal functional activities of the surrounding nutritive tissues, which has been made a point of argument by some writers against fixed bridge dentures, it is reasonable to believe that inasmuch as these same relative movements have been going on from the very biological beginning of human dental organisms, that they are quite as necessary as the mechanical stimulation of normal muscular movements are necessary, for the healthful functional possibilities of all the vital structures of which the muscles are composed. Moreover, the purely nutritive factors—the blood vessels and nerves—of the pericemental membranes are surrounded and interwoven with a network of elastic and fibrous tissue, undoubtedly for their protection against the shocks of mastication and mechanical root movements, which inevitably occur as a part of their existence. Whether or not these movements are necessary for the health and vitality of the root and socket membranes, is not the question; but what is important is the fact that no form of fixed bridge attachment can possibly stop these masticating root movements for any length of time.

It is important to remember in this connection that the main force of mastication is **direct pressure** upon the occlusal surfaces of the teeth, forcing the particular tooth or teeth, under action, deeper into their root sockets, to be followed immediately after the pressure is removed by a return to their normal positions, thru the resiliency of the pericemental membranes. This no doubt is true also of all lateral and disto-mesial root movements under normal conditions. Therefore, the claims of certain writers that fixed bridge dentures do not permit these physiologic movements, seems to me about as absurd as the cry that went up a few years ago by certain orthodontists, that fixed labial retainers do not permit the required relative root movements which normality demands. Whereas, the truth is that no dental appliance, however rigidly attached, can prevent the forces of mastication from moving the roots sufficiently in their sockets for all the purposes of healthful nutrition. Moreover, this retaining appliance referred to, is necessarily so delicate in its construction that it will yield slightly to the movements of the teeth; and furthermore, it is not intended for a permanent fixture as are bridge dentures.

If it is true that no dental fixtures can stop the normal root movements of mastication, it is certainly the most important consideration relative to fixed bridge dentures, because any character of attachment which rigidly binds one tooth to another, that is more or less distantly located from it, is bound to come under the unequal forceful strains of masticating movements which so frequently loosen and break down the most skillfully constructed fixtures, or produce other conditions equally disastrous.

If the piers of a two pier buccal bridge are close to each other, as in cases where a single artificial bicuspid is required,

there is lessened danger, because of the probability of a more equal distribution of the same direction of masticating force. Nevertheless, if one of these piers has a devitalized pulp with hypertrophied pericemental tissues, etc., the slight difference in its repeated and forceful movements, must in time result in disaster to a very large proportion of even these simple bridges.

If the forces of mastication were always up and down, or along the line of the axis of parallel roots that were equally solid in their sockets, and with an even distribution of force, there would be little danger to fixed bridge dentures however distant the piers are from each other. But unfortunately this rarely obtains.

The fact that every attachment of a fixed bridge to its pier is immovably constructed, means that in any inequality of the applied forces of mastication upon one side of the mouth, or the other, or upon the molar piers in relation to the front ones, the entire bridge structure, even to the very apical ends of the roots, must move in exact mechanical co-ordination as if it were one solid piece, whatever the unevenness of the strains.

Therefore, if the molar end of a fixed bridge upon one side is permitted and forced to move in a certain direction, and the adjoining cuspid pier, upon which the same masticating force is not applied is prevented from taking exactly the same relative movement, because of the length, direction or solidity of its socket attachments, etc., the inequality of the repeated strains upon the attachments must in time disrupt the most substantially constructed fittings.

From a mechanical standpoint, the fixed bridge dentures that are in the greatest danger are the buccal two pier, long span kind—say from a second molar to a cuspid—because of the mechanical advantages of the force which causes an unequal movement of the piers. For instance if the great force of mastication is repeatedly brought directly upon the molar pier, driving the roots ever so slightly into their sockets, with no equally directed force upon the cuspid, the strain upon the attachments of both piers will be increased in proportion to the amount of movement at the molar, and the length of span to the cuspid, which in this instance is the power arm of a lever.

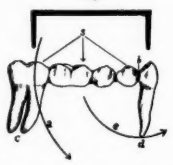
To illustrate this, let us suppose that we have a rigid bar, bent at right angles at its ends, to form the posts and span of a lower two pier buccal bridge solidly constructed, perfectly fitted and cemented in place. (Figure 1).

When masticating force is directed upon the center of this bridge intrusively, or linguo-buccally, there will be little danger to the bridge attachments because the entire bridge with its pier roots will move evenly in the direction of the force. But when the power is directed nearer upon one end than the other the danger to the attachments will be increased in proportion to the distance from the center of greatest resistance.

For instance if the masticating force is brought directly upon the molar causing an intrusive movement of this pier alone, the distal end of the bridge with its pier root will forcibly tend to move along the segment of a circle "a" whose center is at the cuspid attachment, "b".

The fact that the intrusive force upon

Fig. 1



the molar pier tends to drive its roots directly into their sockets with diminished chance for the apical ends, "c" to move along the prescribed mechanical lines, will cause a great strain upon the molar attachment unless the apical ends are mesially inclined.

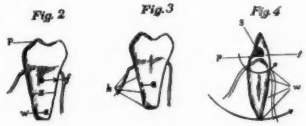
At the other end of this bridge, the strain upon the cuspid attachment is even more severe. The apical end of the cuspid root "d" must tend to move mesially along the segment of a much smaller circle "e" with a force proportional to the length of the span, and with a movement in proportion to the length of the cuspid root.

This mesial movement of the apical end of the cuspid root will be permitted, to a slight extent, by the yielding pericemental tissues. But if this is not fully in exact mechanical co-ordination with the movement of the molar, the integrity of the bridge attachments at this point must in time give way, because of the great mechanical advantage of this repeated forceful lever movement.

There is another root movement of the molar pier that is nearly, if not quite, as dangerous to the attachments, especi-

ally at the mesial end, of this fixed bridge. It is the bucco-lingual inclination or tipping movement of the molar caused principally by lateral movements of the mandible raking against the cusps, or sliding down inclined facets.

In considering this phase it would be well to cognize that all lateral movements of mastication, under normal conditions, produce **inclination** or **tipping movements** of the teeth, and never **bodily movements.** Moreover, the extent, ease, and possibilities of an inclination movement are increased over that of a bodily movement, by the fact that the force exerted in the socket (Figure 2) is concentrated upon two comparatively small areas, and in different directions—one at the gingival "f" and the other at the apical area "w"; and consequently with a double opportunity and extent of pericemental movement, and because of the fact also that the force exerted upon the intermediate cuspid pier thru the medium of the bridge span, "s" Figure 1, and when it reaches the cuspid it is exerted in the form of **torsional** force upon its attachments to the crown. This is a very different character of applied force from that which moved the molar, and also with very diminished mechanical advantage toward moving the cuspid. At the molar the fulcrum of the hypothetical lever of movement is at the gingival borders of the alveoli ("f" Figure 2) with the point of power distantly located at the occlusal area ("p"). Whereas at the cuspid pier (Figure 4) both the fulcrum and power are located near together within the area of its immediate attachment, "p" and "f", and with a twist movement whose center of circular torsional action (s) is exactly in the center of the attachment, with its area of work ("w") distributed over the **entire** length of the socket to the very apical end of the root.



area of the socket is gradually reduced toward its center to zero magnitude. (z).

Whereas, with bodily movements (Figure 3) all the force must be exerted in one direction upon the walls of the socket, and distributed over the entire resisting area "h", and consequently with the possibility and extent of pericemental movement of only one thickness of its tissue.

Moreover, the masticating lateral force, or power back of the movement, being applied at the cusps, is exerted at the most mechanically advantageous point.

To practically illustrate this movement, grasp a lower molar between the thumb and finger and see how easily and appreciably you can move it from side to side. But not by any means as easily or to the same extent when you attempt to move it bodily.

Now when this movement of the molar pier occurs, without the same motive force exerted upon the cuspid pier, it must forcibly tend to move the roots of the cuspid in exactly the same directions as the roots of the molar move. Think for a moment what that means on the cuspid attachment. This inclination movement of the molar must communicate the force of its movement to the

As long as the bridge attachments retain their integrity against this powerful torsional strain, the pericemental movement of the cuspid root will partake principally of that of a bodily movement. I do not believe that any one who is not intimately acquainted with the principles of applied mechanics, or who has not had considerable experience in orthopedic movements of teeth, can appreciate the magnitude of force that would be necessary to move the long roots of cuspids, even slightly, in that way. While it is comparatively easy to slightly move the cuspids from side to side in their root sockets by a pull or push force directed upon the crowns, we would find it would take far more force to produce that same character of tipping movement which the molar takes, with torsional force exerted thru the medium of a rigid bar, or the span of a bridge attached to some very limited area upon its crown.

I am pleased to learn from every quarter that a large proportion of those orthodontists who have been futilely trying to accomplish bodily labial movements of the front teeth with some of the marketed force appliances, according to these same torsional principles, are

now adopting the long established true principles of mechanics. It was incontrovertibly shown in an article, which I published in the Items, that the points of power and fulcrum of these torsional force appliances were only distant from each other the width of a narrow ribbon arch bow (.035") located at the center of the incisor crowns, with the very questionable and certainly tedious possibility of moving the distantly located roots and alveolar process bodily forward and sufficiently to correct pronounced retruded facial deformities.

I do not wish to be understood as claiming that the mechanical forces of mastication, producing incoordinate root movements, will **immediately** break down properly constructed fixed bridge attachments. I have merely attempted to show the principles of mechanical action, and the lever advantages of the forces, which are repeatedly at work toward some form of failure of a large proportion of structures which come within the category of their greatest influences.

In following the description of the mechanics, showing the character of forces and uneven stresses that are exerted upon fixed bridges by normal root movements, we should not lose sight of the fact that these movements are very slight, and while they cannot be wholly stopped without disaster to the work, we **do** know that there are many fixed bridges from skillful hands which **do** respond to all the requirements and which are safely worn for many years. On the other hand I am told that the majority of partial fixed bridge dentures, especially those with long spans which depend upon cast-gold filling attachments at one end or both, cemented into cavities of vital teeth, cannot be depended upon to last many years, because of the uneven strains of masticating forces. This is not so surprising when we realize that there are bridges and bridges, likewise dentists and dentists; and too, when we realize that the strains upon the mesial end attachments of a two pier buccal bridge is at times so great that it has been known to split a devitalized cuspid root thru the medium of its post-attachment.

The frequent desirability of bridging between vital teeth, without devitalizing the pulps to obtain the requisite degree of permanency has led to many ingenious and useful methods for fixed, movable, and removable bridge dentures.

In regard to the most of these, I must say I am not in accord with any method which premises the devitalization of the pulps of perfectly good teeth, nor one which places them in ultimate jeopardy, and which includes extensive mutilations of sound teeth for large gold inlay attachments and boxings for fixed or removable bridge dentures. This particularly applies to the many requirements of one artificial tooth, front or back, between sound or slightly decayed teeth, and especially for young patients.

In my practice, the bodily labial movement of front teeth, upper and lower, to correct malocclusions and deforming facial retrusions, frequently necessitates opening spaces between the back teeth for an artificial **retaining** bridge tooth upon each side. I usually manage to have these spaces fall between the bicuspids, and when two artifical teeth are required on one side, as occasionally arises, the bridge retainer extends also between the second bicuspid and first molar. Again, the absence of certain teeth thru extinction of the germs is a frequent occurrence in general practice. In all of these cases for the younger class of patients in which the adjoining teeth are perfect, the demand for prosthetic restoration which will fulfill all mechanical and artistic requirements, must at times appeal to those dentists who aim at the highest attainments, as a great problem.

I must say that I have at times been appalled at the methods that have been adopted for these younger class of patients, tho I have no doubt the work was honestly performed, under the belief that it was the only way to obtain sufficient strength and permanency. But any extensive cutting away of good enamel surfaces, especially on the front teeth of young patients, to obtain solidity of pier attachments, for fixed or removable bridge dentures, with probable eventualties, is certainly objectionable, tho perhaps not always avoidable with our present methods. I predict that the day is not far distant when another method will arise which will be constructed with greater ease and less suffering to the patient, and will prove to be far more permanent in these special cases, because in its fixed bridge connections between piers, it will possess sufficient

resiliency to permit masticating root movements without destroying the permanency of attachments.

In conclusion, I have to offer a silent but impressive argument against the universal and indiscriminate use of removable bridge-work. (Figure 5.)

Figure 5.

DISCUSSION.

G. W. Dittmar: We have listened to a masterly paper delivered in a masterly way; both are characteristic of Dr. Goslee. I have not a single objection to offer. I entirely agree with the essayist, I agree so much with the whole tenure of the subject as presented that I do not feel I should take any time in discussing it, because I can not emphasize more than he has emphasized the points, he has made, and yet I suppose it is up to me to say a few words.

It seems to me that one of the most fundamental points that Dr. Goslee made is the importance of observing the law of physics in the building of bridges. The thing that causes the loss of teeth more than anything else, barring bad root-canal work, is undue stress. In the excellent letter read by Dr. Goslee, from Dr. Case; that was strikingly and convincingly illustrated.

Septic dentistry was another subject that Dr. Goslee spoke of. There are probably four things in bridge-work which produce septic dentistry. The first is the great bugaboo, defective root-canal fillings. That is probably the cause of more sepsis than anything else. Second, faulty fitting of abutments and piers. Third, faulty form of abutments, piers and dummies. See that these are so formed that they will prevent gingival irritation. Then the fourth important thing is undue stress. These four things produce a great deal of septic dentistry. If however a fixed bridge is placed, where it is indicated, and properly constructed, and the patient will take care of the mouth, I think it is one of the best forms of dental restoration that can be placed in the mouth. Personally I would not consider discontinuing the making of fixed bridges. On the other hand, I do not believe that fixed bridge-work is the proper thing in all cases. There are certain decided advantages in removable bridge-work. There are places where removable bridge-work or removable partial dentures need to be placed, especially where long spans are required and there is much loss of tissue. There are some places where fixed bridge-work would not at all be the proper thing. I want to endorse every word that Doctor Goslee uttered regarding the Chayes system of bridge-work. It is not to be unjustly condemned, it has a place in certain selected places, but it should be attempted only by the exceptionally highly skilled dental mechanic. I have little patience with some of the claims made for this so called movable removable type of bridge-work.

Dr. Goslee in the summing up of his discussion mentioned four or five points. He said there is no one line of mechanical ideas that should prevail; no one system; no one method. No one indivi-

dual idea is so broad or comprehensive as to be universally applied. I certainly agree with all that. All the systems have a place for carefully selected cases. The one to use is the one which will be the most efficient for the patient coupled with comfort, durability and the proper esthetic effect.

I did not have time to prepare a discussion. I only had time to glance over the paper this evening. I listened to the paper so attentively that I could not prepare a proper discussion. Nevertheless I appreciate the privilege of saying these few words.

R. L. Stout: I was agreeably surprised today when I read Dr. Goslee's paper to find the stand which he took. I was prepared to battle for the small fixed appliance and against some of the more complicated forms of removable bridge-work. The word 'usefulness' is the big word in the title of this paper, which is "The Comparative Usefulness of 'Fixed' and 'Removable' Bridge-work." If you go to the dictionary, you find that Webster defines usefulness as "having the quality or state of being useful." If we look for useful, we find "serviceable to an end, helpful, beneficial." The question to decide is, "Has a bridge been useful during the time it has been in service?"

Dr. Goslee indicated in his paper that dentistry was not yet a science. I believe that if we will inoculate the knowledge that we have at the present time with a little more common sense, we will approach a little nearer to being a science.

To condemn fixed bridge-work because some operators have disregarded all the laws known to dental science, would be just as sensible as to condemn the internal combustion gas engine because somebody forgot to put oil in the motor and it stopped on a lonely road from lack of lubrication. The enthusiasm of the patient was given as one of the reasons why fixed bridges fail. Patients, as a rule, have a dislike for anything removable, and it is for us to teach them the advantage of a practical method of restoration which is best suited to their individual cases, and if we allow them to persuade us to place work that will fail, we ourselves must take the blame and not let it fall on the principle of fixed bridge-work.

Dr. Goslee spoke of the "over-enthusiastic followers of focal infection." I would just like to say that I do not believe we have begun to get enthusiastic over focal infection in the jaw. I do not mean by that that we have not yet started to get rid of all the teeth that show infection, but I do mean that when we really get enthusiastic, we will never attempt to remove the pulp of a tooth without first looking at the condition in the jaw and then we will look at it again as we treat it, and then we will look at it again after our treatment is complete. Then if we feel reasonably sure that that operation has been a success, we can go ahead and build any kind of a structure on it. When we begin to do that, fixed bridge-work will not come in for the condemnation it has in the past.

I would just like to say that I think it is about time that somebody in our profession stood up for our rights and demanded that the dentist should be the only court with the right to condemn a tooth to the forceps.

G. H. Henderson: That was a very interesting paper tonight, and I hope some of us will take it to heart, for ever since our good English friend, Dr. Hunter, condemned bridge-work, there has been a change in dentistry. One reason for so much condemnation of bridge-work is because we as dentists have been in the habit of speaking of *dead teeth*. What is a dead tooth? A dead tooth will not remain in the mouth. We should not talk of dead teeth, but

should say pulpless teeth. Neither should we talk about destroying nerves but should say pulps. Let us talk to our patients as tho they had common sense, and if they have none we can put some in them. Our great bugbear is the proper filling of the canals. We know that. A recent number of The Ladies Home Journal had a photo of our lamented friend, Teddy Roosevelt, and two pictures of teeth, supposedly his. The article accompanying them was written by A. M. Jungman. I do not believe he is either a physician or a dentist. He quotes Dr. Henry A. Cotton, Medical Director of the New Jersey State Hospital at Trenton, who says that"Devitalized teeth should not be allowed to remain in the mouth", and a lot more like nonsense. I say that when a man gets to the place where he extracts all pulpless teeth as Dr. Cotton claims they are doing at Trenton, he is in the wrong room in that asylum. I contend that both the articles and the journal ought to be condemned.

I know a dentist in this city who was almost compelled to extract some teeth for a patient because the physician refused to have anything to do with the case until these teeth were removed. On examining these teeth it was found that only one had any reason for its removal.

We have to get down to where we put on bridges in a rational way. It is just as Dr. Goslee says, fixed bridge-work is all right in its place. Some men can only say or do one thing. I have met men who will only put in fixed bridge-work, others will only put in the removable kind. A man who cannot differentiate between the different remedies that we can use is not fit to practice dentistry. We must get down to where we can do things on a rational basis. I hope some of you will read the April number of The Ladies Home Journal and condemn this article as I have done.

Dr. Goslee (Closing): Mr. President, ladies and gentlemen: I have very little to say in closing excepting that I want to thank those who came tonight. I regard it as a compliment both to the subject and to the essayist. Any one who would come out a night like this certainly wanted to hear the paper. I enjoyed the discussion very much but there has not been enough of it, which is a disappointment to me.

By way of explanation I might say this before I close. I intimated at the beginning that I had intended to write a paper along these lines for a long while and so I have. I had such a desire for only one reason. I thought it was necessary for some one to take the stand that I took tonight. Some operators are running wild in certain parts of the country over a certain class of work. I say wild, but that does not cover it and I think some one ought to take them to task.

I want to thank the President, Secretary and the Program Committee for giving me the opportunity to do so.

INDICATION AND CONTRAINDICATION FOR ROOT RESECTION.

By Chalmers J. Lyons, D. D. Sc., Ann Arbor, Mich.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

FOR many years ends of roots of teeth have been excised under the names of root amputation, root excision, maxillotomy, apiectomy, apicoectomy and root resection. The latter term is the one that is more simple and is possibly a more scientific term than any of the others and is the one in the opinion of the writer that should be used in describing the operation for excising the apical end of the root of a diseased tooth. As early as 1884 the technic of the operation was described by Farrar. Many writers since that time have written on one phase or another of the subject until today it would seem that this is an operation that should become an important one in every well conducted dental practice.

Dental and medical science have made it clear that pathologic conditions of the pericemental membrane and diseased ends of the roots of the teeth are a contributing factor to and frequently the primary cause of general systemic disturbances. Dentistry must now assume the tremendous responsibility of eradicating these morbid conditions, either by the extraction of the teeth followed by a curettage or by some other surgical or therapeutic procedure. The time has gone by when the laity and the medical profession are going to permit these morbid conditions to exist, when the knowledge of them becomes manifest. Today the moral duty of the dentist is not fulfilled until he can give a conscientious opinion to the physician and the patient that the teeth and surrounding structures are not the source of origin of low grade infection. Other foci of infection in the oral cavity than those around diseased root ends of teeth is not germane to this paper, consequently our discussion will be confined to the eradication of pathologic conditions involving the apical end of tooth roots.

It is a well known fact that with our present methods of root-canal therapy few of these morbid conditions can be corrected to the extent that we can be safe in saying that the area is secure from a possible source of infection; that in running down the source of a low grade infection this area can be eliminated. Assuming then, that our deductions are correct there is only one course left open to us, viz., surgical procedure.

The surgical procedure can be accomplished in one of two ways—either by the extraction of the tooth and curettage, or by opening thru the alveolar process and excising the diseased root end.

The question now arises how are we to make a correct diagnosis of the case so as to govern our surgical procedure.

No hard and fast lines can be drawn as to just when root resection is indicated and when extraction of the tooth should be the operation of choice.

The writer wishes to sound a note of warning that the operation which we

choose to call root resection is by no means a "cure all" for all conditions of chronic alveolar abscess when medicinal therapy has failed. Indeed it is the opinion of the writer that in many of these cases the patient's welfare will be better taken care of if extraction of the tooth followed by curettage is resorted to.

What then are to be the signs and symptoms which will govern us in the selection of the operation which is indicated?

A correct diagnosis of each case is not at all a simple matter. The first thing to take into consideration is the present state of health of the patient, past illness and the possible recuperative or reserve force of the patient. The lowering of the vitality thru chronic alcoholism or such diseases as tuberculosis, syphilis, and diabetes which lead to a state of constitutional dyscrasia will have a profound influence in preventing repair after these operations. In such cases the operation of choice in eradicating the pathologic conditions around root ends is extraction of the offending tooth followed by a thru curettage of the bone. Age may be a factor which should be considered in determining the indications and contraindications for root resection. In the aged the process of repair is slow and the prognosis for bone repair is not so good as that in the young or in middle life. In a patient of advanced years it would be a question whether the cavity following this operation would be filled in with normal tissue, particularly would this be true if there was much involvement of the apical area, consequently the operation would be undertaken with considerable hazzard.

The normal or abnormal circulation of the blood is another factor that plays a very important role in the success or failure of the operation. It is an established surgical fact that without a certain definite blood supply to a part repair of tissue will not take place. Notwithstanding the fact that the teeth and surrounding tissues have a very rich blood supply, in certain types of individuals and under certain pathologic disturbances such as in the anemic and poorly nourished, there is not sufficient blood supply to the apical area to insure repair of the parts after the operation. This condition is found in the young as well as in the aged, and the clever diagnostician will discover this condition before making his decision as to the character of his operation, that is as to whether root resection or extraction is indicated.

It is unfortunate that today too many men are depending entirely upon the Roentgen ray in diagnosing mouth infection and are governing their whole course of treatment on this knowledge alone. They seem to overlook the fact that the roentgenogram is merely the shadow of conditions in the bone and does not show a picture of the pathology involving the parts.

In making a diagnosis which will lead up to an operation such as this the roentgenogram must only be used as one of our means in forming our conclusions. We may be misled in both directions. The roentgenogram may show the appearance of greater pathology than is actually present and again the tooth root may be interposed between the ray and the morbid area in such a way that it may appear that little or no pathology is present; therefore the extent of the pathologic involvement that will appear to be present will depend upon the angle from which the roentgenogram is taken. This you will readily conceive is not sufficiently definite to wholly rely upon in forming a judicious and conservative diagnosis. The roentgenogram then should only be considered one link in the whole chain of evidence upon which we must base our decision. Then again there may have been some involvement and rarefaction of the tissues before therapeutic measures were resorted to

and which the patient's natural power of immunity and resistance will clear up after the infection has been eliminated from the canal and tubuli of the tooth.

It may take months and even years for complete regeneration to take place so that the shadows of the tissues will appear to take on the same density.

If we can be satisfied the end of the root is not denuded of its pericemental membrane then in the writer's opinion the case can be watched and a series of roentgenograms be taken at stated intervals and compared. The patient should be apprised of the fact that this particular tooth is under suspicion. Here again the general state of health of the patient must be considered, and the technic of sterilizing and filling the root-canal must be a part of the chain of evidence which goes to govern our procedure.

If the case is of an alveolar abscess of long standing or a case of imperfectly filled root-canal with granuloma when all the evidence points to disease or death of the pericemental membrane in the apical area, it is the opinion of the writer that surgical procedure rather than dental therapy is indicated. Dr. Clarence J. Grieves, Dental Cosmos January 1914, in a paper on "Dental Periapical Infection as the Cause of Systemic Diseases" voices my opinion exactly when he says: "There is to my knowledge no medicament nor method germicidal oxydizing or electrolytic, that will revivify the pericemental apex. If it be vital, the tooth is healthy; if it be diseased, the tooth is next to doom. This is the point in treatment when materia medica stops and good surgery begins."

The character of the surgical procedure may be root resection in favorable teeth and extraction of the tooth in the unfavorable cases.

Again we approach the subject of diagnosis. What is to be considered favorable cases for root resection? It is a lamentable fact that many men are resorting to this operation as a short cut method of eradicating an alveolar abscess over a beautiful crown or bridge attachment without first removing the crown or bridgework and sterilizing and properly filling the root-canals.

Thoma in his book on "Oral Abscesses" says "Apicoectomy is only successful if the root-canal has been sterilized and properly filled previous to the operation. It is not sufficient simply to amputate the root where the old filling ends, but the root-canals and dentinal tubules have to be sterilized or there will be reinfection from the tubules exposed where the root is cut. If it is not worth while to remove a crown and treat the root-canal, the tooth should be extracted or there will be a recurrence and the patient is as badly off as before. It is not justifiable to leave a crown on a tooth because it is a masterpiece of art, if the foundation upon which it is built ruins the patient's health." This expresses the writer's views exactly. Too many times this operation is done with the view of saving a nice piece of bridge-work when no attempt is made to eradicate the source of the infection. It should be a matter of routine not to do this operation unless the canals and tubuli have been sterilized and filled just previous to the operation. We are not doing good surgery when this is not done.

What are the most favorable teeth for the operation? For some time the writer has been limiting this operation to single rooted teeth and upper 1st bicuspids. This limitation has been made for two reasons. First, because of the accessibility of these teeth, a clean surgical operation can be performed. Second, we can be more sure of our sterilization and filling of the root-canals.

The question of sterilizing and properly filling canals in multirooted teeth for the eradication of an infection has been a very doubtful procedure in the mind of the writer and in his opinion

the patient's welfare will be better taken care of in these cases by extraction of the tooth followed by curettage of the bone.

It is possible in a few cases to resect the entire lingual root of an upper molar or the mesial or distal root of a lower molar and preserve the remainder of the tooth for further usefulness for a limited time. Such procedure however, is usually only temporizing and if the patient is suffering from systemic disturbance the operation would under no conditions be indicated.

Where the bone and pericemental membrane are diseased from the apex to the gingival margin of the gums the tooth should be extracted rather than try to save it by root resection. In no case should this operation be resorted to when the tissues are diseased beyond the apical third of the root of the tooth.

In conclusion let me say that if this operation is to take its place in conservative dental practice, our diagnosis will play a very important role. Our whole success will depend upon whether our diagnosis has been correct. In other papers upon this subject you will hear about the preoperative and postoperative treatment and the modus operandi, yet these will avail nothing towards success of the operation if our diagnosis has been faulty.

The welfare of the patient should be the first consideration and a hasty diagnosis may lead to just simply an operation rather than a judicious successful treatment of the condition.

TECHNIC OF ROOT RESECTION.

By Carl D. Lucas, D. D. S., Indianapolis, Ind.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

THE first and most important adjunct for the success of this operation is absolute surgical asepsis, if a favorable prognosis, succeeding the diagnosis, may be concluded.

Conductive anesthesia should be induced following the established aseptic technic, which it is unnecessary to describe in this discussion.

We will first consider the preparation of the patient, operator and surgical nurse.

The operator and nurse should thoroly scrub their hands and arms with soap, sterile nail brushes in sterile water for fifteen minutes, then bathe the hands and arms in a sterilizing solution of five per cent Lysol, then five per cent bichloride of mercury, rinse in sterile water, followed by seventy per cent alcohol, all of the above solutions being contained in sterile basins.

The operator and nurse must then be clothed in sterile gowns and sterile caps or masks covering the hair, be adjusted. The patient is then draped with a sterile sheet, a sterile towel is placed around the patient's hair and the head rest is covered with a sterile towel, these towels being pinned securely to place. The patient's face is then scrubbed with seventy per cent alcohol and another

sterile towel is placed under the chin, and the ends pinned together over the towel which covers the hair, leaving only the mouth, lips, cheeks and nose exposed.

If the patient should be a man wearing a mustache and beard, sterile gauze may be folded into eight thicknesses and pinned to the sterile towels, covering the beard, then the lip retractors adjusted, or eight thicknesses of sterile gauze covering the entire face may be adjusted with a longitudinal slit cut in the gauze to gain access to the buccal orifice only, and the lip retractors adjusted.

The patient should be in a recumbent position and a sterile head band adjusted which is to hold the lip retractors into place. A sterile saliva ejector may be used to advantage, if the operation be performed in a surgical dental office. The operator and nurse should then put on sterile gloves.

All of the teeth which will be exposed during the operation and the mucous surfaces of the lips and gums should be sponged with seventy per cent alcohol and full strength tincture of iodine lavishly applied to the crowns of all exposed teeth, then the entire buccal field of operation sponged with seventy per cent alcohol.

Sterile cotton rolls or sponges are then placed under the lips anteriorly and posteriorly to the immediate field of operation, having previously adjusted the lips retractors to the head band.

All instruments, the engine hand pieces, cotton pellets, sponges, towels, operating gowns, gloves, the amalgam for filling the subsequently prepared cavity in the pulp canal and everything with which the operator or nurse may come into contact, the instrument table top and all appliances used must be absolutely sterile. The instrument table tops should be covered with sterile towels before the instruments are placed thereon.

Surgical Procedure

A crescent-shaped incision thru the gum tissue and periosteum is made approximately three millimeters above the cervical line, or below it for a lower tooth and the periosteum with its superimposed gum tissue is elevated with a periosteotome to a point three millimeters beyond the apex of the tooth to be operated. The incision must be sufficiently large to permit an unobstructed view of the operative field.

If the outer plate of bone is intact it is burred or chiseled away to the diameter of the pyogenous granuloma and this pathologic tissue may frequently be removed from the crypt intact, excepting its immediate circumferential attachment to the periphery of the pericementally denuded root.

The exposed apex and the crypt are then sponged with ninety-five per cent phenol, being careful not to touch the soft tissue with the acid.

A number eight round bur is used to resect the root to the point where it is supported by the viable pericemental fibers which are attached in the canaliculi of the alveolar socket and in the lamella of the cementum, beginning the resection at the apex of the root. A mallet and chisel may be employed to advantage by first nicking the lateral sides of the root just apically to the viable pericemental support, then placing the sharp chisel edge upon the labial side of the root at the point where the lateral nicks have been made and with a sharp blow of the mallet, remove the apical portion of the root intact, then resect the root with burs to the point where it is definitely supported by bone.

The root end is then rounded peripherally and polished with mounted cylindrical Arkansas stones. The crypt should be curetted free of its sclerotic bony walls because this sclerotic bone is inoculated with the organisms and their toxines.

We have proven this by having

inoculated culture media with such scrapings and having grown the organisms by incubation. This is a point of great consideration, therefore should be emphasized.

The thoro curettage of the sclerotic walls of the crypt removes the infected bone and the remaining viable bone which contains within its lacunae the osteoblasts with its normal vascularity, insures the mechanical removal of semiviable, infected bone, making the prognosis reasonably positive.

A self retaining cavity is then prepared with its axis in the pulp canal.

Sterile cotton pellets are then packed into the crypt, at the mesial, distal and lingual aspects of the root end and the cavity for the reception of the amalgam filling is sponged with ninety-five per cent phenol, followed with seventy per cent alcohol, dried with sterile cotton pellets, and filled with sterile amalgam.

The amalgam must be tightly packed into the cavity, a slight excess being used and condensed against the cotton pellet which is on the lingual side of the crypt.

When the pellets are removed they will carry the excess of amalgam from the crypt, then the filling must be smoothed off flush with the cavity margins.

The crypt is then flushed free from debris, dried and sponged with tincture of iodine, followed by seventy per cent alcohol.

The retracted muco-periosteal flap is then released and sutured back to position with interrupted horsehair sutures, cutting close to the knots or with a number four black silk or linen, running suture.

The blood clot which forms and fills the crypt is derived from the Haversian system of the bone and from the capillaries which are ruptured by the needle in placing the sutures. The clot is antiseptic, therefore is the best surgical dressing for the crypt and should not be disturbed.

Packing the wound with gauze and the subsequent irrigation of the wound is not only unnecessary, but is contraindicated.

The patient should use an antiseptic mouth wash every two hours following the operation for two days and every four hours for two days thereafter and the operator should see the patient every twenty four hours for five days following the operation, spraying the surface of the flap with a mild antiseptic solution.

The sutures may be removed the fifth or sixth day, when healing of the flap by first intention will have been complete.

Embryonic fibroblasts will be generated from the endothelium of the capillaries and be deposited within the organized blood clot, forming a fibrous matrix. Osteoblasts from the lacuna will be deposited within the fibrous matrix and subsequently osteanagenesis will completely fill the crypt with reconstructed bone, similar to the histological collus of an united fracture.

It is preferable to have had the pulp canal sterilized and filled with guttapercha a few hours prior to the operation.

If the root in question be supporting a pin crown and the pulp canal is incompletely filled, the amalgam filling in the canal of the resected root will prevent secretions from entering the pulp canal, becoming disorganized and infected hematogenously, also prevent infection from within the canal from invading the operated field.

By following the outlined technic of closing the wound with sutures, the resultant scar will be linear, which is causmetically preferable to a scar which results from leaving the wound open.

By relying upon the organized, antiseptic blood clot as a surgical dressing within the crypt, postoperative osteodynia is much less severe and the

introduction of extraneous infection is precluded.

It is advisable to have the pulp canal of any of the lower anterior ten teeth enlarged, sterilized and filled with amalgam before attempting apical resection. It is practically impossible to prepare a cavity in the end of a resected lower root on account of the acute angle at which the lower teeth are placed to the plane of operation.

Buccal roots of upper first and occasionally second molars, depending upon the size of the buccal orifice, may be successfully resected. It is frequently necessary to completely dissociate one of the buccal roots of an upper molar. The exposed canal, in this case, should be prepared with a self retentive cavity, this cavity sterilized as indicated above, and filled with sterile amalgam. The same technic may be employed in the dissociation of the lingual roots of upper molars.

The percentage of success in these operations is at least ninety-five per cent positive and the negative five per cent may be accounted for by faulty diagnosis of the radiographic negatives. Our failures have been attributed to our inability to diagnose lateral perforations of the roots. If we could project the buccal and lingual linear perspective by radiogram we would be able to eliminate these faulty diagnoses, but on account of this being practically impossible, on account of our not being able to place the film and tube at the angle necessary to gain this perspective, we are frequently misguided by the negative necessarily having been made at antero-posterior exposure.

This faulty radiographic interpretation may frequently be detected at the time of operation, but occasionally this is impossible on account of the perforation presenting outside of the field of operation, close to the cervical line.

However we do not hesitate to present and urge this technic as the procedure par excellence for the definite, complete and rational treatment of any chronically abscessed upper or lower central or lateral incisor, cuspid, first or second biscuspid tooth.

Discussion.

Elmer S. Best, Minneapolis, Minn.

It is with pleasure that I compliment the essayist on the many very excellent ideas which have been presented. Dr. Lyons made a splendid point in his reference to the importance of correct diagnosis. Dr. Lucas' outline of his aseptic preparation is deserving of praise and I am very happy to hear Dr. Silverman draw attention to the fact that it is not good procedure to seal infected material in a canal by placing amalgam in the apical opening after the root apex has been resected. The subject has been quite thoroly covered by the three essayists and they have left very little to be said, but I would like to discuss with you for a few moments another phase of the work.

When we perform an apiectomy, we have a certain definite object in mind. We wish to remove an area of infection which lies contiguous to the root end. This might be accomplished by extraction, but in an extraction are we as careful to remove the area of infection as thoroly as we do in an apiectomy? If we are not, then we have failed in our duty. When we remove infected pulpless teeth the operation is not always complete when the tooth is removed. We have established a means thru which we can operate in the event of diseased tissue lying in the apical region. It is so important in these cases that we be as careful in removing the infected tissue in extraction as in apiectomy.

It is hardly to be expected that we can establish any operation so it will be performed the same by all operators, but one thing we can do, we can establish principles, and the principles gov-

erning this operation should be the same as the principle governing any other operation in surgery or dentistry. When we have finished, we should be able to feel that as the result of our efforts the patient is in the best possible condition we could place him. The interpretation of that principle I am willing to leave to the individual operator.

In connection with the postoperative pain so frequently a factor in these operations, I have found that after the wound is entirely cleaned out, if we place equal parts of Iodoform and Novocain in the bottom of the wound with a powder syringe, that our results are most gratifying.

In view of the fact that the subject under discussion has a definite relation to pulp canal operations, I want to say that I fondly hope that the time will soon come when we will not be called upon to do such an operation we may not see such a time, but we have the matter so in hand at the present time that it is not necessary to remove many vital pulps. In fact, as a plain statement of facts, I might say that in our own practice a vital pulp is almost never removed unless it has been exposed and then it is a case of removing the pulp or the tooth.

When removing pulpless teeth in cases of metastatic infection, we should recognize the strategic value of certain teeth to be used in reconstruction and our efforts should be centered on trying to save such teeth. I am now talking to you about a problem you are vitally interested in and I know you appreciate the significance of such cases. When you are confronted with such a problem and you know that the loss of a certain strategic tooth means the total wrecking of the mouth so far as anything aside from a full denture is concerned, and that many sound, healthy teeth will be lost as a result of inability to save a certain tooth having great strategic value by doing efficient pulp canal work, one has a mighty comfortable feeling when they realize that they have mastered the technic of root-canal work as it is now developed.

Don M. Graham, Detroit, Mich.

That there is a wide difference of opinion regarding the question of apioectomy is apparent, in reviewing the literature on this subject. We heartily agree with Dr. Lyons that only suitable and favorable cases should be undertaken if a reasonable degree of permanency and success is to be expected. Far too many cases have been undertaken. Indeed, it was with a good many operators, a short-cut route for the correction of careless, slip-shod and ineffectual methods at root-canal work.

A few years ago, when focal infections were not so well understood as they are today, roots carrying crowns and bridges were amputated, for no other reason than that of evading the removal of these structures, and the sterilization and obliteration of these canals. Under pressure from the dentist, who perhaps constructed a very beautiful restoration on a very septic foundation, we yielded to the temptation of excising roots and curetting apical areas in blissful ignorance of the fact that most of these canals and root fillings were septic to the pulp chamber instead of the tip end of the root filling. The writer confesses to the advocacy of apioectomies on the ground of economy to the patient, and is perfectly willing to accept his full share of the responsibility for this practice. We want therefore to emphasize the importance and absolute necessity of preoperative measures, if we are to hope for success. It is worse than useless, it is indeed malpractice, to perform this operation on a tooth unless we are reasonably sure that the canal has been thoroly sterilized and completely obliterated. It is not sufficient to know that we have excised to root-canal filling. We must know also, that canal has been

recently sterilized, successfully and effectually filled, if we are to do full justice to this operation.

Now that we know the consequences of septic root-canals, let us profit by our past errors, without, however, condemning and discarding this whole procedure. The writer can see no reason why a tooth of good osseous support, but with a denuded, resorbed apical tip, can not be excised successfully and safely after canal has been thoroly sterilized and obliterated. In the opinion of the writer, it is preferable to the practice, so much in vogue today, of sterilizing and filling, or rather overfilling root-canals, and accepting the subsidence of inflammatory conditions as conclusive evidence of success. Experience has taught us that many of these so-called cures are only temporary cessations of inflammatory processes. There is surely many times the unattached root area, in the latter case, with the probability of re-infection being proportionally greater. The practice of filling canals of denuded, resorbed, apical root ends, without any surgical interference can not be too strongly condemned, regardless of the fact that the vast majority of them will show repair and subsidence of inflammatory conditions.

The question of root-canal fillings for teeth to be excised is all-important. Whatever material is used, thoro sterilization of canal, and complete obliteration of the same is essential. Where a careful excision is made and a smooth surface attained, gutta-percha appears to be quite as good as tin or amalgam. We are of the opinion that the latter materials are more difficult of insertion and for this reason they are not employed.

We are all agreed that a local anesthetic is the one of choice. While we have no criticism to offer to the conductive method, we would like to say in passing that the greater percentage of these excisions can be made under the infiltration method. Its only advantage is, perhaps, that of conservation of time, yet we can not forego this opportunity of making favorable mention of our old friend "infiltration," which has become in these latter days, almost entirely ignored and despised.

The question of immediate closure of wound will depend greatly on circumstances. It is the writer's practice to leave good drainage space in all advanced cases pack with gauze and allow the wound to heal under observation. There is no doubt, but the majority of these wounds can be closed with good results, but there is an indefinite and uncertain percentage of cases that will not so happily terminate, and for very good reasons These chronically infected areas cannot by any method be incised and curetted without leaving a goodly number of bacteria within its walls, causing secondary infections to follow in some cases.

Postoperative treatments, as a rule, do not present a serious problem. When secondary infections do occur, appropriate measures should be instituted,—drainage and irrigation, when indicated, employed. In some cases postoperative pains will call for attention. Packing the wound with novocain-iodoform gauze or orthoform-novocain paste will generally prevent severe postoperative pains. In some cases, however, postoperative pains will tax our patients and ingenuity to the utmost. A sedative, such as pyramodal, codine or morphia, will be indicated according to the severity of the case, and they will be found to help wonderfully in tiding over a distressing period, which fortunately is generally of short duration. Where much inflammation and swelling is present, continuous irrigation of hot normal salt or a borax solution will be found valuable. Drainage, of course, should always be employed when indicated by the presence of secondary infection terminating in suppuration. In short, apioectomy can be safely and satisfac-

torily employed in suitable and well selected cases.

Carl D. Lucas (Closing): Dr. Silverman said he would prefer to use chisels instead of burs because the burs clog. A bur should not be used very long at a time in this operation. The clogging of the bur may be controlled by having the assistant nurse keep the burs free from debris. The burs used should be new. If you will run the engine slowly, you will not overheat the structures. Heating the structures involved will result in leaving a mass of charred tissue, therefore will impair the ultimate result.

Dr. Silverman laid stress on the shape of the incision. I prefer a crescent-shaped incision to a straight one, incision affords an unobstructed view of the field of operation because the crescent-shaped can be made very quickly by taking a scalpel and making the incision straight, then directing the point of the scalpel, under the periosteum, making an incision upward mesially then placing the scalpel under the periosteum on the other side and repeat the technic. In that way you can make a curved incision in about three seconds, where it takes Dr. Silverman one second to make a straight incision. Another reason I like a curved incision is because when the flat retractor is adjusted upon the crescent-shaped incision, you will have less tension upon the flap and, therefore, less traumatic injury.

It has been mentioned by the respondents in discussion that it is undesirable to seal infection in the canal with amalgam; I always prefer to have the canals opened, mechanically cleaned and sterilized to the best of our ability, before performing this operation. No one with any judgment would question this preference. Dr. Grieves in his paper yesterday said it is absolutely impossible to sterilize pulp canals. I believe if you prepare the cavity in the axis of the pulp canal after resection, sterilize the cavity, and properly fill it with sterile amalgam you will preclude the possibility of any infection, which may have remained in the canal from invading the operated field and re-infecting the area. It has been mentioned on the floor this afternoon that if you seal an infection into a canal, the infection will pass thru the canaliculi, into the pericemental membrane. Gentlemen, you know that would be impossible. If you seal the apical portion of a tooth and force any known stain with a hypodermic syringe, under pressure, into the pulp canal, you cannot force that stain thru the homogeneous layer where the cementum is attached to the dentin of the root. You cannot infect the cementum thru the tubuli because the granular layer of Tomes, which is between the cementum, and dentin is impervious to the most active stain. I have tried it many times and it is impossible to force any stain thru this layer, therefore the pericementum cannot become infected thru this homogeneous layer.

If our laboratory technic is dependable sealing the pulp canal with amalgam is successful because of the fact that after from five to eight years following this operation, I have made incisions into these operated fields, and in cases where surgical technic was observed during operative procedure, cultures from the preoperative field proved negative. In these tests we incubated these cultures for weeks and weeks with no growth of organisms. This is as positive a proof as I can offer to you that these operations are successful according to the methods which we are employing today.

Some one said that sutures should not be employed in closing large areas. I used to believe that. The dental profession has a great deal to learn about that one point. General surgeons are closing wounds five times as large as any wounds we will close in the jaw following this operation, with good results. By making bacteriological ex-

aminations of these regions years after operation and getting negative cultures, demonstrates that closing the wound with sutures is a success. There may be extremely rare cases in which drainage is preferable. That is comparatively a small matter of choice, governed by circumstances.

Dr. Best spoke of postoperative pain, and the use of codeine to control the postoperative pain. My experience has been that when I close a cavity and allow an antiseptic blood clot to fill the crypt no postoperative pain results, unless I may have employed faulty surgical technic. The reason we have postoperative pain, is because our operation has not been done under strict surgical technic. Some men contend that we cannot employ aseptic surgery in mouth operations. I have had bacteriologists make cultures of the operative field during operation in many cases and they have failed in getting a growth of microorganisms upon the inoculated culture medium from the field of operation.

Dr. Best emphasized a point about the granulation tissue extending into the maxillary sinus. I have operated many cases on bicuspids where the infected tissue extended thru the osseous floor of the maxillary sinus, but I want to say that unless the infection is draining into the maxillary sinus thru the walls of the sinus, I never puncture the mucous membrane which lines the sinus, because I can remove the granulum without perforating the membrane. I think it would be an evident faulty technic to perforate the membrane lining the maxillary sinus. Absolute asepsis is the word in root resection. There is where your success or failure lies. If you observe absolute aseptic technic during this operation, I think you will get excellent results by following the technical procedure advanced in this symposum.

S. L. Silverman, Atlanta, Ga.: Dr. Best spoke of infections that are likely to get into the antrum. I am of the opinion of Dr. Lucas that is I have yet to see a case that penetrated the antrum unless it were an acute case. If you accidently let your chisel penetrate into the antrum, just forget it and it will go along all right, but if you want to have an antrum infection following an accidental perforation, all you have to do is to treat it with iodine and you will get an involvement of the antrum.

I do not agree with Dr. Best that it is dangerous to operate on the lower jaw. If you should perforate the mandibular canal, let it alone and it will get along all right. If you fail to treat it, leaving it alone, it will certainly be all right and the numbness that follows such an accident will disappear. In many cases where we remove the mandibular contents, the sensation comes back in spite of us.

ANATOMY—THE FOUNDATION.

By Henry W. Morgan, M. D., D. D. S., Nashville, Tenn.

(Read before the Illinois State Dental Society, May 13-16, 1919.)

IN ACCEPTING the invitation of your program committee to meet with you today, I have not been actuated by any feeling that I would be able to make a contribution that would in the slightest degree equal the great honor you have done me in asking me to be here.

I gladly sieze the opportunity to make full acknowledgment of the fact that thruout all the years of my professional life I have been a student of the works of those great men, members of the Illinois Dental Society whose high ideals, wisdom and influence have contributed so wonderfully to the uplift and scientific development of dentistry everywhere.

In the hope that I may say something to be remembered by, I have chosen as my subject,"Anatomy—the Foundation."

When all the teaching world at least, was wrestling with the problem of a curriculum for the "four years course in dentistry" your essayist asked himself one night the question, what is the object of a dental education? And the answer that satisfied came quickly, to make a dentist. But what is dentistry? A branch of the healing art. What is the great object of the healing art? At first the relief of human suffering. In recent years also the prevention of those diseases that cause the suffering.

Man then may be spoken of as the "Anatomical unit." With this thought well fixed in our minds, it requires but a few moments reflection to bring us forcibly to the conclusion that every branch or specialty of the healing art has for its foundation, anatomy. It is the common science of all. A knowledge of anatomy is therefore pre-requisite and I use the term here to include what is commonly incorrectly denominated "Histology," but should be spoken of as microscopic anatomy.

My hearers are saying to themselves all this we know, anatomy has always been among the first subjects drilled into us. Yes, this is true, but has its important relation to the other subjects been sufficiently emphasized? Has their dependence been pointed out understandingly? Where have we learned that the nomenclature of nearly every subject we are supposed to make use of is directly derived from anatomy? That before beginning a study of them we should first become familiar with every organ and tissue of the human body.

Have these facts been sufficiently impressed upon us in our preparation to practice to say nothing of our teaching?

Such thoughts lead to the inquiry as to what are the subjects that are so dependent upon Anatomy.

A great deal has been written and said about the "Art of diagnosing," but where is there a chapter or a magazine article that points out clearly that the basis of all diagnosing is a knowledge of the normal anatomy of the part or parts involved in the disease? Yet the rational treatment pre-supposes a correct diagnosis. Without a knowledge of

the normal how will one recognize the diseases? Let me observe here that many names of diseases are also derived from the anatomical names of the tissue involved.

The assertion has been made that the nomenclature we use is taken from anatomy. Let us see of what subject this is true. Certainly of operative dentistry, prosthetic dentistry, operative and prosthetic technics, oral hygiene, oral surgery, physiology, orthodontia and clinical dentistry.

If the instruction on all these subjects depends on anatomy for the nomenclature that is necessary to make them clearly understood, is it not logical and sane to see that those who are coming into the profession should first receive their instruction in that subject which is to furnish them the technical language that will be used by their teachers? Otherwise the student is bewildered, gets but a hazy impression of what he is listening to, or the instructor must review the anatomy relating to his special field, wasting his time and that of his pupil.

I do not deny that there are many ardent students of anatomy in our profession, and we owe to them a great debt of gratitude. I come not here to belittle my profession nor in a fault finding mood, but to say that in these days when so much of the responsibility is being thrown upon the profession, by the "late discovery" that the work that we are called on to do, is upon tissues that are indeed a part of the human body, and in intimate relation with every other part of it, and we are to be held accountable for these remote disorders, I hope to present a new angle of thought upon what seems to me the foundation of all our work.

I believe that the science of dentistry is sufficiently advanced to stand the test that these new demands are making of it. Where the thoroly trained are the tested, the errors responsible for systemic infection are not near as common as they are supposed to be by some of the profession. I know men whose patients do not suffer from systemic disorders due to improper dental service and in this connection permit me to say that the mere elevation of requirements are not sufficient to make us appreciate and become more familiar with technical knowledge. Preparatory training is helpful but does not always furnish us with a basis of sound logic and a clear insight. Its possessor may be able to analyze conditions, weigh facts, decern their relation to each other and yet without that high ideal which leads to self control, honest purpose and true love for his fellowman, his whole career is a failure.

Discussion.

Edmund Noyes, Chicago.

I am very glad to say a few words about the subject which has been presented to us by Dr. Morgan. We give too much time and too much interest in our societies (and for fifty years we have done the same thing in our schools) to the technical aspects of our profession, and too little to the scientific and fundamental subjects upon which our profession must be built if we are to be professional men, in addition to being technicians.

I congratulate you and the profession upon the waking up which we have been getting in the last few years in regard to the responsibility that we have, and the relation which our work has to subjects and conditions and diseases outside of the mouth. It has already made it easier for teachers in schools to get some interested attention, not merely a perfunctory attention, to such subjects as anatomy and histology, (which has been rightly called microscopic anatomy) and the subjects immediately built upon them, physiology and pathology. Chemistry relates to all of them.

For fifty years I have watched and

known something about dental education, and you know and I know that the students in our schools have cared almost nothing for these scientific subjects except to pass, and if they could cram them for two weeks before examination, they did not care whether they remembered a syllable of them after they got into practice or not. They thought they were not of much consequence, and I am very sorry to say they got too much encouragement in that attitude from the members of the profession who, after a few years of practice, ought to have learned better. We have had to buck against not only the attitude and feeling of dental students but the attitude and feeling of the dental profession, and I rejoice that we have got a shaking up that will cure us of that attitude of mind.

The paper we had this morning about anesthesia has anatomy for its foundation, and anything that any of you do along these lines is dependent upon the most careful study of the anatomy which is involved in the procedures, and the increasing use of local anesthetics, and nerve blocking especially, has immensely stimulated that necessary study and acquaintance with the anatomy of the head and face.

Something similar is coming in regard to the relation of histology to the pathological conditions concerning which we have heard so much in late years. Microscopic anatomy of the tissues, otherwise histology, is the foundation upon which is built the functions of the tissues. Physiology that is worth anything is cell physiology, that is, it concerns the functions and activities of the cells of the tissues. Pathology as the next step is a deviation from normal cell activity and cell function. The three sciences are absolutely dependent upon each other, and the microscopic anatomy is the foundation of them.

I congratulate you and the profession upon an awakening interest in these matters. We shall in a few years, thanks to this changing attitude, stand side by side with the medical profession and understand them and have them understand us. It is as necessary in this day that the medical and dental professions should understand and cooperate with each other in close consultation, as it is that the general practitioner of medicine should frequently and understandingly consult with the nose and throat specialist, or with any other specialist in medical practice. The two professions must be in close cooperation, educated so as to be equal, and fit for the responsibilities and duties that come upon us.

We owe a debt of thanks to Dr. Morgan for bringing this subject to our attention.

Thomas L. Gilmer, Chicago.

I regret that I have been asked to discuss Dr. Morgan's excellent paper since I am wholly unprepared. I have had no time to study it. If Dr. Brophy were here he would tell you that pedigree plays an important part in farm animals. Having been a farmer all my life, I am quite in accord with the theory that there is much in pedigree. I know this man Morgan's pedigree. I know his father, William H. Morgan, who was one of the most lovable, intelligent, and learned men we had in the profession. I have heard him speak on many occasions, and he always inspired me for better things, and so we have been inspired tonight by the son of that pioneer in dentistry.

Dr. Morgan says that anatomy is the foundation of dentistry, and so it is, and that histology is only finer anatomy. This is equally true. In 1871 histology was not taught even in the best medical schools. If anatomy is the foundation of dentistry, then it seems to me that dentists should be so taught that they may become a part of the medical pro-

fession. I wish they were, and I think the time is coming when an arrangement will be made by which dentists can be fully educated medical men. Our schools are teaching more of some of the fundamentals of medicine than were taught in the medical schools fifty years ago.

To understand anatomy, the dentist would be greatly helped did he have a classical education prior to commencing his professional study, because he could then more easily understand the terms generally in use in anatomy, which are Latin or Greek, or a combination of the two. In my teaching of students, I have endeavored to instill into them that anatomy, histology, and physiology are just as much a part of dentistry, as any other part, such as operative or prosthetic dentistry. It has been difficult for the students to understand why anatomy, chemistry, oral surgery, and physiology are useful to a dentist, but when they get into practice their eyes are opened to this necessity.

Radiographs of the jaws are often misleading, particularly if one view only is made. It is as suggested, not only a good plan to have more than one exposure, of the same area, at different angles, but also exposures of the opposite side of the mouth for comparison, in order that errors may not be made in reading the pictures.

Dr. Morgan's paper was extremely interesting and timely, and I wish to thank him for having presented it.

Frederick B. Moorehead, Chicago.

Anatomy is one of the fundamentals, and fundamentals need neither amplification or confirmation. Air, sunlight and food are fundamentals of life. One does not need to confirm the fact that food is a fundamental; one cannot live without it.

The relationship of air, food and sunlight to life, is analogous to the relationship of anatomy to medical science in any of its branches. One is just as destitute in the world of medicine without a thoro knowledge of anatomy, and just as incapable of functioning in the world of medicine without a knowledge of anatomy, as one would be incapable of functioning in life without food or air.

The ancillary of anatomy is chemistry. Analyzed in their entirety, anatomy and chemistry constitute in a large way the entire world of medicine, and practically all that we know of medicine relates either to the subject of anatomy or to chemistry. This being true, it is scarcely necessary to argue the point that unless one knows anatomy and chemistry, he cannot take any satisfactory place in medicine or any of its branches.

The term anatomy is more or less a composite one. We have, first of all, zoology, embryology, comparative anatomy, microscopic anatomy or histology; and finally, gross anatomy. Broadly speaking, these subjects all belong to the subject of anatomy.

Beginning then, with anatomy, we have, first of all, the study of the cell. Cell life is basic to all life. The cell is undoubtedly fundamental. This is just as true in plant biology as it is in animal biology. A knowledge therefore, of cell development, is a requisite to appreciation of anatomy.

In the study of embryology, we see the building of cells into tissues and organs.

The subject of comparative anatomy belongs rightly in zoology, and should be taught as a part of the course in zoology. The thread-worn method of presenting comparative anatomy to dental students has, I believe, done much more harm than good, as it has not been presented in its proper relationship.

In the study of microscopy or histology, one familiarizes oneself with normal tissue. It need scarcely be stated that unless one is familiar with normal

tissue, one is not likely to appreciate a departure from the normal, or pathology.

Pathology is, I believe, one of the simplest of the medical subjects, provided one knows zoology, organic and physiological chemistry, and histology. I am speaking now of laboratory pathology. Living pathology is still another subject.

In the study of gross anatomy, one becomes familiar with the dependence and inter-dependence of structures, and gets some idea of the physical mechanism. Before the student undertakes the study of gross anatomy, he should be familiar with all of the other phases of the subject of anatomy. Unless he has this information first, gross anatomy will mean nothing and he can learn it only by the process of tabulating isolated terms.

It is gratifying to note that in some of our better dental colleges, these subjects are being presented in some sort of intelligent sequence. We hear much these days about local anesthesia and how it should be taught. It is perfectly obvious that unless one is thoroly familiar with anatomy, more particularly gross anatomy, and has a good working knowledge of chemistry, he is not at all likely to do satisfactory work in local anesthesia.

Given one who knows his anatomy and his chemistry, and has some appreciation of asepsis, he already has the materials for developing technic in the production of local anesthesia. Without this training, he may acquire some stereotyped method which after all is neither satisfactory nor safe.

To functionate therefore, with satisfaction and intelligence, in the world of medicine, whether as a dental specialist or any other form of medical specialist, it is quite necessary that one shall know his anatomy, and his chemistry.

Dr. Morgan (Closing the discussion:) There is very little left for me to say except to acknowledge with gratitude the complimentary and highly pleasing manner in which my paper has been received.

There is one name that has been mentioned in the discussion that I am always ready to kneel to, the name of one whom I called father. I was never worthy to unlatch his shoestrings, but when I hear grateful things said about him, and have them applied to me, I feel very humble indeed. While I do not deserve them, they are pleasant to hear nevertheless.

I did not know there was so much in this subject until I heard these learned gentlemen agree with me so heartily and add so much to it. I have obtained a great deal of inspiration from what they have said, and I am grateful to Dr. Gilmer, Dr. Moorehead and Dr. Noyes for what they have said. If I re-write it in the future much that they have said, shall certainly be used.

TEXT BOOKS FOR SCHOOLS.

By Maude Tanner, D. D. S., Portland, Oregon.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

NO DOUBT to the dentists of all nations there is only one greater subject of vital importance to the welfare of humanity than oral hygiene, and that is winning the war. And since only healthy men can win wars, it becomes the duty of the dental world to roll up their sleeves to fight a long, long battle for oral hygiene, that our young people and future soldiers will receive the knowledge of health preservation when they should have it, and the time to receive the fundamental education along any line, or subject, is in early childhood.

So let us begin to teach oral hygiene with the little kindergartners and the first and second year of grade school work in order to leave an everlasting impression of the value of mouth hygiene.

For many hundreds of years we have been teaching children to become men and women thru the medium of schools. They have mathematics, English, penmanship, history, spelling, geography, physiology, engineering and many more subjects, anywhere from the ages of six years to fifteen, as fundamentals, along with music, art, domestic science, tailoring, mechanics, millinery, etc. In fact, all things are taught our children to give them a fair start as a requisite to enter college.

During all of this preparatory work not once has the subject of oral hygiene been touched upon by the schools, that is, in the way it should be. A lecture too technical for the pupils to understand, or a blackboard demonstration by the teacher, who has not had sufficient teaching along these lines, who does not know the first principle of teaching a child how to take a mouth bath, or to do her own, because *she* has not been properly taught. Why? Because there is no text book for her, none for the child, or the home, and none in public libraries. So where are they to receive the knowledge as a means of preventing mouth diseases and general diseases, which are brought about as a result of oral infections?

It is useless to think newspaper and magazine propaganda is going to reach the people and give them the desired information and knowledge. Newspaper statistics show that only 50% of the homes take a daily paper, and that only 15% of the total population in the United States subscribe to the daily papers. Newspapers, we all know, are read to learn what is transpiring in the world today; to learn what securities are good; what the baseball news is, market reports, and who Mrs. Smith entertained at her dinner party. They are not looked upon as a source of academic information and such information is very slightly read. Please understand, I am not against newspaper propaganda. I believe it will do a certain amount of good, but the percentage is too small. It is not a good investment. Newspaper publicity will not reach the

required number of working people and they are the ones we must reach. They are the *hub* of the nation and the *main-spring* which progression rests upon, and if any one in the world needs good health, it is the working man. He is the man we will only be able to reach thru the schools, by educating his children while they are young. They will give him enough information, that great benefit will be brought about while you and I are here to see the good work.

Now we come to our citizens who do not read or write. Do you know Oregon is the second highest in percentage of literacy in the union—Nebraska has first place, yet Multnomah County, in which the city of Portland is located, with a population of 300,000, there are 4000 illiterate people, who not only do not read the newspapers, but people who cannot read anything. These figures must be about the same thruout the country.

How else are we to reach these people and their children except thru text-books in the schools, where reading and studying is not a casual thing to be taken up or let alone, but where it is compulsory.

A fair example of conditions can clearly be demonstrated by the report of the Chairman of a local branch of the National Child Welfare Bureau, where free information on feeding, dressing and care of children, examinations, etc., were to be had for the price of a street car ticket. The Chairman made this remark to a newspaper woman who happened to be in on business, "What in the world is the matter with our attendance? These people are not the ones we want to reach. These are intelligent mothers, who know how to care and feed their babies. These babies are scoring from 90 to 100%. They are not the ones we want to reach." The newspaper lady said, "My dear madam, do you know the people you want to reach do not read the papers? They do not know such valuable information is here for them. They do not understand things technical either. They must have plain simple information, and we will have to take it to them."

This is exactly the situation with oral hygiene propaganda. We will have to take the information to them. To do so *we* will have to put text-books into the schools. When I say, *we* must put text-books into the schools, I mean the dental profession. No one else can do so. No one but a dentist can produce such a work, which will meet school room requirements. A physician could not write such a book, neither could any writer, who does not have a dental degree.

Then let us look where public demand is soon to lead us. The dental population is decreasing every year, due to many causes, while the demand for dentistry is increasing in leaps and bounds, and inasmuch as at least 90% of all oral diseases are preventable thru education, why not meet the demand of the public thru preventive measures rather than the curative, at the same time forcing the *slacker* dentist to modernize and do as nearly 100% efficient work as possible.

A new feature which has been slightly gone into regarding oral sepsis and its result is life insurance companies. I have with me, to my knowledge, the first life insurance physical examination blank which has ever included questions on the mouth and teeth. The Central Life Insurance Company of Indianapolis, Ind., in their 25th question asks: "Are the teeth defective? If so, to what extent?" This was brought about thru the efforts of oral hygiene. We *well* know in a short time what to expect from other companies—that they will turn to the dental profession with hands up for help. Hadn't we better begin now by working ahead of time on the root of the evil, by means of placing text-books in the schools and kindergartens?

Perhaps one of the strongest points in

favor of text-books on oral hygiene in the schools is the industrial and commercial side of the question. Do you know in a short time no boy or girl, man or woman, will be given employment anywhere who has a badly diseased mouth and teeth? Why?

First: They are far below normal in efficiency and people are finding it out.

Second: They are carriers of diseases and the public is finding it out.

Third: Appearance which plays a great part in securing and maintaining employment.

From the nursemaid to parcel wrapper, laundries, factory workers of every kind there are, teachers, social workers, and every person in some way serves us something, which they come in very close contact with before it reaches the consumer. Should the paper boy who delivers our morning paper, the girl who weighs a pound of cheese, or wraps a paper of pins, the mailman, the builder of ships, or the ice man, no difference who they are, apparently healthy and well, be a carrier of diseases from a dirty diseased mouth and teeth? Therefore, we must begin at the root of the evil to obtain the best results.

The employer will not employ the man who has a diseased mouth. Therefore, he becomes a weak link in national economics and a burden to society. Such being the case, the government is going to take up the question of oral diseases and make great demands from many angles and none other than text-books on oral hygiene in the schools, and the dentist. Will the requirements be met?

This question has already been proven by the rejection of the heavy percentage of applicants for army and navy service.

This brings the question back to the schools direct. In New York City in 1916, 67,000 children failed promotion because of their absence from school, 80% of which was due to defective teeth. According to figures gathered from one of the schools at Portland, Ore., in 1917 by the principal of the school, education costs $54 a year per child. This money must come via the tax-payer. If repeaters cost $54 per year, imagine the millions of dollars needlessly lost, and the years of time lost forever by the poor unfortunate coming citizens.

In this age of individual efficiency, sound judgment will not permit further delay of the wholesale spread of the principals of oral hygiene. Quoting from modern wide awake educators who know the truth, that the time is at hand when we shall quit talking about a sound mind in a sound body and turn to doing something instead. Surely knowledge of dental hygiene is as important as that of Borneo, the subjective mode or square root, yet we pay no attention to the one and actually fail children for failure to absorb and apply the other. We shall stop being absurd some day and turn to oral hygiene.

Quoting our beloved Dr. G. V. Black, in a letter dated January 21st, 1911: "I am very decidedly of the opinion that if our children could be taught to take proper personal care of their own teeth, that teaching would do more good than can be done by all the doctors in Christendom."

Discussion.

Burton Lee Thorpe, St. Louis, Mo.

The originator of all great movements in the world's history has been a dreamer of dreams and a seer of vision. In 1900 at the National Dental Association meeting at Old Point Comfort, Dr. Richard Grady, whom we proudly denominate the originator of the oral hygiene movement, by introducing a resolution to this association, recommending the appointment of a "special committee of five to consider the expediency of inaugurating steps looking to the co-operation of the public schools in teaching "Good Teeth, Good Health."

This was the start and I congratulate

myself of having some small part later in the developing the further good work in the cause of National Mouth Hygiene that has since developed to be international in scope. At Birmingham in 1909 the high preferment of being elected President of the National Dental Association fell to my lot. At that time and place I had the pleasure of appointing a committee on oral hygiene.

Some friends interested in this cause suggested to me a "live wire" for Chairman of the Committee and this man I appointed as such and he proved by his wonderful work his efficiency, that man was Dr. W. G. Ebersole (Applause) who brought about a propaganda that became world wide, teaching the lay people to think, talk and practice mouth hygiene until now the average school child is the derision of his playmates if he or she has unclean teeth or an unhealthy mouth.

The propaganda against alcohol where did it have its first beginning? It was in the primary school text books, in the school readers and physiologies, its impressive lessons were taught the child and from these teachings it is known to every man and woman, tho many times not practiced by them, that alcohol is the most Potent and insidious poison absorbed by the human system and Thank God it is only a few months or years, at the most until the great moral campaign against alcohol that has been so far reaching is to be realized and these United States are going to be dry. (Applause).

I have known Dr. Tanner since 1906, as a student at dental college and oral hygiene was her most earnest hobby then and since. It has been her desire that this subject should be brought into the home and daily practice of every child in our country. I know her enthusiasm, her sacrifice of time and money to realize this desire. Her first book on this subject, at her own expense, was put into the public schools of Oregon.

In my home city often have mothers asked me "where can I get information about my child's teeth and mouth?" I did not know until Dr. Tanner sent me a copy of her book. Immediately I had five different stores in St. Louis place this book on sale, the cost of which is very reasonable—only $1.00 each.

Recently she has published another book for the kindergarten grade; a beautifully written book, illustrated with pictures of elephants, lions, storks, teddy bears (laughter)—the four-legged ones I mean.

Just this is needed to impress the child's mind and incidentally the lesson of mouth hygiene is taught.

This section can do no more than endorse this book and assist in giving it the publicity it deserves.

To convert the heathen you must catch them when they are young, and this principle applies truly to the object and desires of this subject we are preaching.

For just this sort of educational propaganda as kindergarten lessons is needed in teaching the benefits of mouth sepsis. (Applause).

Charles H. Oakman, Detroit, Mich. The Oral Hygiene Committee together with Doctor King, reviewed the manuscript for Doctor Tanner's book last year, and found the same well written and well illustrated, and it will no doubt be found very interesting and instructive to the child as well as the parents.

We thought that the National Dental Association might indorse this book in order to facilitate Oral Hygiene Work thruout the United States.

It is the only book of the kind so far as the Committee knows. The Committee has been groping in the dark for a long time for a book on Oral Hygiene suitable for young school children. Doctor Tanner's book fills the bill in every particular, and in fact has

exceeded the expectations of the Oral Hygiene Committee. Doctor Tanner is to be congratulated in the good work accomplished. I fully agree with Doctor Thorpe in his discussion of the book.

Major Mitchell, Oklahoma City, Okla. One of the great disappointments to me at this meeting was that I was so busy that I could not get here to hear Dr. Tanner's paper. A year ago I looked over the manuscript very carefully and it is a book I became very much interested in. I have also become very much interested in the great work Dr. Tanner is doing. I was so interested in the plan that I wanted the National Dental Association to take action at that annual meeting and I was disappointed that the matter had to be placed on the table for a whole year. I was anxious for the schools to get the benefit of this book. It gives me very great pleasure indeed, knowing the book as I do, knowing the purpose back of it, knowing the hard work that has been put on it, and knowing that it is the best thing we have today, to most heartily endorse the motion and add my second to that of Dr. Oakman.

George F. Burke, Detroit, Mich. It has been my good fortune to have read the text book edited by the essayist, and am convinced of its great value as an educational medium in the public schools. The subject matter of this book presented to the children during the developmental period would work wonders in giving to children a better and more satisfactory understanding of this important subject.

Dr. Tanner's book is worthy of sincere consideration on the part of boards of education, and I believe she has won for herself a very honorable and lasting place in the hearts of all those interested in this important subject in giving to the public this valuable book. In the medical profession those that can talk, and make themselves understood to laymen thru the medium of the press and periodicals could perhaps be counted on the fingers of one hand. So the dental profession has in the minds of many, never given birth to such a man as Woods Hutchinson, but when one reads the various passages contained in the little volume, so carefully prepared by the essayist one feels that there has at last arrived a dentist that can present this subject to the child mind in an interesting and attractive form.

Those of us who believe in the adoption of this book in the schools are not influenced in any degree because it is Tanner's book, but we favor it for the reason that up to the present time she has compiled the best volume of this kind, that has been called to the attention of those interested in this subject.

W. G. Ebersole, Cleveland, O. I am very much interested in this book of Dr. Tanner's, because in my early experience in oral hygiene we undertook to produce something that would be used in the schools. I am very much interested in what Dr. Tanner said in regard to no one but dentists being able to produce something that could be used in the schools. I want to say this, that it is only a dentist with very rare qualifications that can produce such a book as we have here this morning. In my experience we had early in our mouth hygiene work a request from schools and requests from those interested in the publication of school physiologies for a chapter that would deal with mouth hygiene, and we undertook to have one produced. It was written by a very learned man in the profession, but it was wholly unsatisfactory. It was written in such language that it would be of value only to dental students. We have something here—I saw it for the first time this morning—which as I glanced thru it, I think is a God-send not to the dental profession but to humanity if something of this kind can be put into our schools. How are we going

to do it? A motion is before the house to ask the National Dental Association to do it. I am heartily in favor of it, because the support of the National Dental Association behind something like this is a great asset. We heard something from Detroit where they are doing wonderful work. We are to hear later from Rochester where they are also doing great work. We need something that will tell the story to the people in a way that they can grasp it. I think we have it. I have only been glancing thru the illustrations, because I was interested in the papers.

I was very glad when I got my program the other day to see that we had a section of oral hygiene and that mouth hygiene was back on the program. Now if you are going to do things, you must have a mouth hygiene section that fills your room not only with an audience but with enthusiasm. During recent years we have been carried away with research foundation work and we have forgotten not only in the National Association but elsewhere the importance of mouth hygiene. If we teach mouth hygiene, if we do our work as it should be done, there will be little need for the controversy as to whether we should "pull" devitalized or pulpless teeth or not. The thing to do is to commence in the schools and teach the child the danger of neglecting the teeth, and I am strongly opposed to the promiscuous extraction that has taken place all over this country, the result of some of the propaganda that has been put out by this Association. I had a very prominent member of the profession say to me within the last two weeks, "I tremble for the dental profession if we go on with our promiscuous extraction." I do not tremble for the profession but I do tremble for humanity unless we take up the conservation side and carry it thru. The loss of a tooth is to my mind just as serious a proposition as the loss of a finger, and the loss of a number of teeth just as bad as the loss of a hand. Now in the future I think it is our duty as a section on oral hygiene to take this matter in hand and to teach the children of America the value and importance of the mouth in building up the men and women as strong as we hope to have them, Mr. Chairman, in the future following this great war when we shall have learned the value for the first time in America of strong physical beings, not only in muscle but in mind and morally as well.

Maude Tanner (Closing.) I do not know what to say. I didn't know my books were to be discussed at this meeting. I feel very much like a Japanese student who was asked to make a speech. He said he had been back and forth to Japan a number of times, he had been to St. Louis, to college. One night some of his student friends got hold of him and told him he would have to make a speech. He said, "Ladies and gentlemen: I have been scared many times in my life crossing the great ocean and not speaking the English language, but I was never so scared in all my life as being called on to make a speech." I feel much like the Japanese at being called on to say something. I am not accustomed to speaking.

I think I will honestly never stop working as long as I live, on oral hygiene, simply because our little children need it, and because lost teeth in their mouths are not coming to them. They do not deserve such things. I lost a number of my teeth when I was a child. Physicians extracted my teeth, and I am angry about it yet. That is why I work for the children.

THE TREATMENT AND FILLING OF ROOT-CANALS.

By Fred W. Gethro, D. D. S., Chicago, Ill.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

NO SUBJECT in operative dentistry gives greater opportunity for diversity of opinion in almost every phase of the operation than does the one we are to consider.

The subject of pulp treatment, pulp destruction, pulp removal or what I consider most important of all—pulp preservation—is, to my mind, the most important subject the dental profession has ever considered. There is not a part of this most exacting technic that does not call for strict surgical cleanliness and my intimate knowledge of student practice combined with a like knowledge of the average practitioner's methods is not of the character that would give evidence that these procedures are being carried out with surgical cleanliness plus the exacting technic required for this important service. The fact that some operators here and there all over the country are doing some beautiful operations in root-canal treatment and filling does not alter the main fact. The removal of a pulp and the necessary treatment are strictly surgical procedures subject to all the dangers of surgical interference. When the profession appreciates the delicacy of these operations and the serious responsibilities that accompany them, we will have fewer infections. Unless the operator can form a mental picture of the conditions which may occur as the direct result of a lost pulp, he must fail in his appreciation of the importance of preserving this healthy pulp tissue.

When we see the bad results following faulty pulp removal, the failures due to faulty pulp canal treatment and the more evident and glaring failures of root-canal filling and then follow these with their usual accompanying infections which penetrate to the tissues beyond the end of the root and observe the destruction that follows in the bony structure and then realize the great menace these focal infections may become to the patient's health, we begin to have a proper conception of the seriousness of these infected conditions and the responsibilities which we assume in the care of the mouths of our patients. An operator who is not assuming this responsibility is not doing himself or his patients justice. If the dentist does not feel competent to pass judgment on these cases then he should consult with somebody thoroly conversant with the conditions. It is not sufficient to have some one see the X-Ray film for most of these cases require examination of the patient in addition. The dental profession is very lax in not taking advantage of these consultations with fellow practitioners. The reason that many do not make use of this important feature of successful practice is the fear of criticism on the part of their patients, or perhaps some fear unfavorable criticism from other members of the profession. This hesi-

tancy to consult with others is a sign of weakness, for the better informed men welcome consultations. We can learn a valuable lesson from members of the medical profession for they never hesitate to consult with each other in obscure cases. There should also be more frequent consultations with members of the medical fraternity.

The literature of the past and the text books of the present on the subject of pulp treatment are so different in their teachings that a mere mention of the various claims represents the widest possible division of opinion. I say opinion because many of them only represent the opinion of the individual or a group of individuals without anything of scientific value on which to base these opinions. Some years ago, I reviewed all of the past literature on this subject (covering a period of 70 years) and the material I discovered in some two hundred articles was a revelation. In addition to finding almost every phase of empirical practice from the placing of permanent vent openings for the continual discharge of pus to sealing the pulp canal with putty, I found that there was hardly any material under the sun that had not been used for root filling. I want to refer very briefly to some of the materials advocated in some of these journals.

The following is but a partial list of the various materials used in root filling:

Asbestos, cotton, silk, wool, paper, tannic acid, and oxychlorid of zinc, cotton imbued with alum water as a temporary or trial root filling, orange wood and almost every other kind of wood saturated in phenol, fiddle string dipped in creosote, gold, paraffin wax, copper thread, floss silk, white shellac, gum copal in ether, animal charcoal and iodoform, beeswax, paraffin impression of canal and then making a metal filling from that impression, carbolate cosmoline, thread, lint, lead, iodol, vaseline carbolic, marine lint saturated in tar, wires of various metals which includes broken broaches, sealing wax, crystals of iodoform, coal dust, sponge and putty. Please do not think that any of these materials are imaginary: they are all copied from our dental journals.

It was advocated by some that different materials were required in different temperaments. I have wondered how a patient might feel if he knew that his temperament indicated coal dust, sponge or putty for root filling.

When we consider that prior to 1882 only one article dealing with sterilization appeared in our dental journals, we can well understand the causes of failures of the past. Failures of the past are not to be wondered at but the failures of the present have no such excuses to offer. The teachings of today offer every opportunity for the student of this subject to obtain the latest and best information, and our present literature, both medical and dental, abound in material dealing directly or indirectly on the importance of these focal infections to general health conditions.

The present practice among the leading surgeons of today, with exception of the surgery on the European battlefield, is to discard the use of antiseptics within the tissue. This is a complete reversal of practice of former years. It is true that the use of antiseptics inhibits bacterial growth but they also inhibit nature from making a normal repair. The present tendencies of many of the dental profession is to continue in the use of strong medicines within the tissues. A rule that should always be applied would be—never use anything in the treatment of a root-canal that can possibly injure the delicate tissues at the end of the root. It is unnecessary and extremely dangerous. For the same reason I do not use arsenic for pulp destruction because I am convinced that many times the arsenic is responsible for the injury

to the investing tissues. I am firmly convinced that before many years all the better informed men will discard the use of arsenic for pulp destruction.

The equipment necessary for pulp removal, pulp treatment and root filling is very limited. The important consideration in this treatment is a thoro asepsis which means surgical cleanliness. This means caring for the teeth to be included in the rubber-dam field and the cleansing of the adjacent soft tissues. The use of antiseptics for this part of the operation is unnecessary. Before the pulp chamber is entered, the rubber-dam, properly adjusted, is essential. After the rubber-dam is placed, the field should be made sterile by the use of a good antiseptic, such as oil of cloves, I*II*III or phenol and then followed by the use of alcohol. The opening into the tooth should be made sufficiently large to see readily and operate without obstruction. With a sterile field and a good sized opening so that all parts of the pulp chamber are readily accessible, the removal of the pulp or the enlarging of the canal should be done with barbed broaches. If barbed broaches are used as they should be used (never twisting them) I can assure you that the breaking of a broach in a root canal is quite impossible. The exact detail of the method followed in this curettement process is quite difficult to describe. The first broach to enter the root canal should not extend in more than two millimeters. The size of this broach must depend upon the size of the canal we are entering and the withdrawing motion of this barbed broach results in the curettement or enlarging of that portion of the canal. This should then be followed by a barbed broach somewhat larger and this method continued until that particular portion of the canal is as large as necessary for future thoro treatment and successful root filling. The rest of the process should be continued in the same manner until we have reached the apex of the root.

The question frequently asked is, "How is one to know when he has reached the apex of the root?" There are several things of importance that will assist us in determining when we have reached this point. The most important is to know that the normal foramina at root ends is much constricted and if we use broaches of proper size which will not penetrate these small foramina, we can, in most cases, measure very accurately the length of each root. Here the X-Ray film is of great value, if it has been properly made, and we can measure the length of these roots on the films very accurately with a millimeter gauge. The element of pain indicated by the patient when a broach or other material comes in contact with the tissues beyond the end of the root is not at all reliable and should seldom be considered of value in determining this point. Nothing of any nature,—broach, medicine, root-canal pluggers or root fillings should ever penetrate thru the end of the root. It should be remembered that there is the greatest difference in barbed broaches. Most barbed broaches are not sufficiently tempered to be effective cutting instruments for the curettement process. A barbed broach that is pliable and will bend and twist without breaking is practically useless for this process of curettement.

The correct interpretation of the X-Ray film is a most important requisite. Various conditions, when taken from different angles, may appear quite different or in many cases totally different. This could easily lead to a mistake in diagnosis which might lead to a very serious mistake in treatment. Many of the X-Ray films are not well made and in most of these cases I consider it a mistake to attempt a diagnosis. We should invariably insist on a good clear film. We must be extremely careful

about declaring that there could be nothing wrong with a case where the film seems to indicate a perfect condition. Many conditions such as dead pulp, acute abscessed conditions, etc., are rarely shown on an X-Ray film. It is a serious mistake to attempt to make a diagnosis on the film alone except in some very marked conditions. The examination of the parts in conjunction with the film is essential. The average fees received for this class of operating is out of all proportion to the value and importance of the service. No discussion of this subject is complete without reference to this unfortunate condition. A surgeon can frequently perform one or more major surgical operations in the same time taken for the treatment of root-canals of one tooth. There can be no doubt but what this particular point of poor fees is largely responsible for the poor results obtained in the treatment of teeth. The entire blame must be placed on the dental profession.

Assuming that we have root-canals that are clean and sterile, I will now endeavor to cover the points to be followed in the filling of the canal. I cannot believe there can be any serious discussion of the root filling material. Gutta-percha points are universally recognized as the very best material available. However there is great variation in the material used in conjunction with the gutta-percha points. In my own practice, I use nothing but gutta-percha points and a sparing amount of eucalyptol.

The use of eucalyptol is essential in the filling of root-canals for the following reasons:

First. It acts as a solvent for the gutta-percha.

Second. It acts as a lubricant for the gutta-percha points greatly facilitating the root filling.

Third. It displaces any remaining moisture in the root-canals because the eucalyptol has a great affinity for the dentin.

Fourth. It is an antiseptic.

There can be no reason for using anything excepting eucalyptol with gutta-percha in the larger canals. The great danger in the filling of the larger canals is that the material will penetrate the tissue beyond the end of the root. More than half of the root-canals we are called upon to fill are in this class. If the other class—the small canals—are sufficiently enlarged they can be best filled by the same process. If these smaller canals are not enlarged to a reasonable size, chloropercha should be used preceding the placing of the gutta-percha points. The more chloropercha used, however, the poorer the operation. The length of the teeth which has been established by the broaches and the X-ray films should be a vital part of the record kept of the treatment and filling of the root-canals. A root-canal plugger should be selected that will reach to within two millimeters of the end of the root. This measurement should be indicated on the root-canal plugger so that the operator will know when this instrument has reached to within the two millimeter measurement of the apex. The diameter of the point of this plugger indicates the diameter of the gutta-percha point selected for filling. The gutta-percha point is picked up with a pair of pliers and cut to a length of about two millimeters. The end of the plugger point is slightly heated and attached to the larger end of the gutta-percha point. This eliminates the necessity of the operator's fingers coming in contact with any of the material entering the canals. The diameter of the gutta-percha point should be slightly in excess of the diameter of the root-canal plugger point because the gutta-percha will pack and conform to the shape of the canal. If the root-canal plugger with the gutta-percha point has been replaced in the

canal to the measurement previously established, we are assured that this first piece of gutta-percha has reached the end of the root hermetically sealing the foramina. This first piece of gutta-percha spells success or failure in the filling process. I recommend that an X-Ray film be taken with this first piece of gutta-percha in place. I cannot think of any more exacting test of one's ability in root-canal technic.

I know of no department in dentistry where operators are wasting as much effort and time as they are in the treatment of teeth.

I believe that 75% of the effort placed on the treatment of teeth is wasted.

I maintain that all teeth regardless of conditions can be successfully treated within a period of two or three days. Where a canal has been thoroly curetted under aseptic conditions and when that patient returns the following day with such a canal, clean and sterile, that root is ready for root filling. A canal should be filled just as soon as it is clean and sterile. The sooner it is filled after reaching such a condition the better.

When we consider the conditions of the country at the present time and realize the importance of every one working at maximum efficiency it should be the patriotic aim of every operator to eliminate all waste effort. Many operators thruout the country are wasting effort on teeth that cannot possibly be returned to a healthy condition. It is well known that when the peridental membrane at the root ends has been destroyed and the cementum of these root ends are pus soaked that we can never hope to get a normal attachment of tissue to that portion of the cementum. No amount of treatment thru to root-canal will bring about a cure of such a condition.

There is one other point in the treatment of teeth that frequently escapes our attention. I want to refer very briefly to the very much impaired strength of the dentin as a result of the loss of the pulp. The loss of the pulp is one of the important steps in the loss of the tooth.

Practically every fracture of teeth is caused by the loss of the pulp. I believe that other conditions being equal, the loss of the pulp means a loss of at least 50% in the life of that tooth.

In this brief discussion I have tried to emphasize the following points:

1. The preservation of a healthy pulp is the most important service we can render.

2. When pulps have to be removed or teeth treated, surgical cleanliness is imperative. This means the same careful treatment for dead pulps, infected pulps abscessed conditions as for a normal healthy pulp.

3. The curettement process is the best and safest method for the removal of pulps and the enlargement of canals.

4. All small canals must be made sufficiently large for successful treatment and root filling.

5. No medicines must ever be used in the canal that could possibly injure the delicate tissues at the end of the roots.

6. No instrument of any nature should ever pass thru the foramina.

7. Every treatment must be hermetically sealed. This eliminates all temporary stoppings, and many of the cements. Base place gutta-percha is the best material for this purpose.

8. Make your operations thoro. Complete the treatment as quickly as possible. Most root-canals can be filled within two or three days regardless of complications.

9. Realize the value of your treatments and receive a fee worthy of this important service.

10. Remember that there is only one

safe root filling and that is a normal healthy pulp.

The lesson to be learned from a study of this subject is that the removal of pulps and the subsequent treatment and root filling are to be looked upon as hazardous for the health of the patient. The success of these operations, even in the hands of the most skillful operators, is more or less uncertain.

We are not simply removing a nerve, we are removing tissue and in carrying out this process we are exposing our patients to all the dangers of surgical interference. We must realize that there are many difficulties encountered that will defy the skill of the best operator. Therefore pulp conservation is the keynote of this discussion.

Discussion.

H. Edmund Friesell, Pittsburgh, Pa.

I want to compliment the essayist on the excellent paper that he has given us; and this compliment is not made, as most compliments are, to essayists who have relieved the audience by leaving the platform. This compliment is meant from the bottom of my heart, because I believe this is the most satisfactory paper I have heard in a number of years on root-canal treatment or on the treatment of teeth.

In this day, when the fad and the bizarre are running riot in many of our active fields in dentistry, root-canal filling has been pretty nearly at the head of the list, and it is a wholesome thing to have a man who is actually carrying out these things and who has been doing so for many years, show us that the matter of the treatment of teeth, while a very important one, is not, to the careful and conscientious and skillful operator, an impossible procedure or one that does not promise very definite and very satisfactory results.

I am not going to attempt an extended discussion of this paper. The essayist has covered it fully; but I do want to lay stress on a few points.

The first is that strict surgical cleanliness and surgical asepsis is the most important thing in this type of work. We are so used to hearing those words, surgical cleanliness and surgical asepsis, that we do not really take their meaning to heart. But that is the key stone of the whole situation, and we must learn what it means, and we must *over-do* it in the practice of dentistry until such time as we actually know what surgical cleanliness really does mean. We must exaggerate it, we must stress it until we reach a satisfactory point in surgical cleanliness in the treatment of teeth. The removal of the pulp is of course strictly a surgical procedure.

And then the next thing I want to stress is the emphasis laid by the essayist upon thoro mechanical cleansing of the root-canal. If the technic of the method of operation be mastered and if the root-canals be thoroly cleaned mechanically, we will not have to depend upon drugs or medicaments of one kind or another to do our work for us.

I also agree with the essayist in disapproving the forcing of anything in the way of filling material beyond the apical foramen of the root. I do not care what some people think about it, I do not want anything of the kind done in my teeth and I do not care to do it in the teeth of my patients. I think that by the technic which Dr. Gethro has described and which I have seen him employ many times, that it is not necessary to have a result of that kind in order to be sure that you have reasonably filled the root-canal.

He also makes the statement that the X-ray is only an adjunct in diagnosis. Certainly that is true. The X-ray is an important adjunct in diagnosis, but it is only an adjunct; and to be of real value, must be accompanied by intelligent steps in the other stages of diagnosis. A good

X-ray must be obtained if it is to be of any value at all, and there is need in this country for a great many more dental radiographers. Every section should have an expert dental radiographer, and the dental radiographers should do this work, because it is very doubtful whether we can obtain satisfactory results from the X-ray mechanic or the medical radiographer. It should be some one who is familiar with conditions, so that the general practitioner and the dental radiographer in consultation can make a better diagnosis than is possible otherwise.

Dr. Gethro gave us a very interesting list of root-canal filling materials. Most of them I am familiar with; but one thing is new to me, and that is that at one stage of the evolution of this work the patient's temperament seems to have had some bearing upon the selection of the filling material. There are many interesting things in dental literature, and some like this, would be of benefit to us by their negative value, and I hope when the Dental Index Bureau gets its work on the market that each one of you will realize that there is much in dental literature that is now a sealed book, and that you will avail yourselves of the opportunity to support that movement and learn much about dentistry that I fear most of us do not know.

Edgar D. Coolidge, Chicago, Ill.

The subject of the treatment and filling of root-canals must ever be one that affects the entire profession and one that requires the constant thought and effort of every man active in this line of work.

The principles expressed in this splendid paper corresponded so closely with my own ideas of the subject that there is very little for me to discuss, but several things I should like to emphasize.

It is possible for two men to vary a little on the details of the technic and yet arrive at practically the same result, and after all, the result is what we are after. However, I do not like the statement that "it is possible for a wide variation or a diversity of opinion in almost every phase of the operation," which the essayist makes in his opening paragraph.

There are many parts of this great problem of handling of root-canals that may be looked upon as general principles, which, I believe, if recognized as such would make it possible for greater progress in the development of the thought along this line.

The first principle is surgical cleanliness. Those two words should express all that is necessary to convey to the mind of every operator the many details of sterilization of equipment and material to be used in these operations, without the need of reviewing them in discussing the subject. If one is unfamiliar with the term surgical cleanliness, one should attend a surgical clinic in a hospital and satisfy one's self as to what is meant by the term and then return to one's own operating room and try to carry out in an efficient but practical manner the same care in every detail. It is not necessary to state in these times that materials cannot be handled in the fingers without contamination and all methods requiring the handling of materials with the fingers are extremely out of date.

A second principle is that of the classification of the conditions found to be treated. First, clean cases, the pulp of which is vital but must be removed for some reason. Second, the pulp that is infected but the periapical tissue uninvolved. Third, the infected root-canal with infected periapical tissue. These three conditions must be treated in an entirely different manner. Surely our responsibility is greatest in the first case, that of removing a healthy pulp. Of course, I agree with the essayist, that preventive methods are a better service to the individual and our greatest effort in dentistry should be along preventive lines. However, some conditions present where it seems advisable to remove

a healthy pulp and if our methods are efficient and worthy of consideration in this day of progress in all other lines of dentistry, this class of cases should be handled in such a way that there would be one hundred per cent of success. I do not mean by that statement that one hundred per cent of all root-canals can be filled to the foramina, but do believe that if they are filled under strict asepsis without excess, the chances of future infection will be reduced to a very small per cent.

The second class brings in a greater element of danger from future infection in that the dentin may have become infected. This brings a difficult problem before us of disinfecting the dentin without injuring the periapical tissue, which in this case has not become infected. The drugs for the treatment of such conditions are limited to mild antiseptics, as our essayist states. Much importance in the disinfection of these canals should be placed upon the curettement and enlargement of the canals preparatory to filling.

I agree with the essayist that in the third class of cases, namely, those with infected root-canals and an infected periapical tissue, that many teeth thus involved must be extracted and yet since the determination of this condition is largely dependent upon the diagnosis made by the radiograph, it is possible to save some teeth that appear to be in rather a hopeless condition from one radiograph, since other radiographs can be taken from different angles to show a variance of the appearance in the radiograph. The diagnosis should not be made from a single radiograph in cases of question, and there is a fair possibility that after careful treatment, thoro curettement and accurate filling of seeing the entire rarified area clear up and by keeping such a case under observation over a period of years, it may be found to remain cleared up and be dismissed as cured.

In the preparation of the field for operation, I differ from the essayist in that I prefer the use of tincture of iodine to bathe the isolated teeth rather than anything else, because of the alcohol content as well as the iodine content, both of which, I think, are more effective than the drugs suggested in the paper for that purpose.

In the process of curetting the canal, I differ slightly in that I have been able to get better success in enlarging the entire canal at the same time with files as well as barbed broaches, working from the foramen to the pulp chamber constantly. I use a large assortment of sizes of broaches, beginning with the smallest, a triple extra fine, and using each size until a large broach will pass the entire length of the canal without passing thru the foramen and until the canal is large enough to receive the plugger for packing the gutta-percha into the apical third of the canal: The author's technic, both in curettement and filling, is excellent, and it is only in minor details that I vary.

When the canal is ready for filling it is moistened with eucalyptol, and then a minimum amount of chloropercha is passed to the apical third, followed by a piece of gutta-percha selected according to our measurement in length and diameter to fill the space between the plugger point and foramen. This first piece of gutta-percha is passed into the apical third and pressed down to our measurement, which assures us that the space beyond the plugger is well filled and can be later verified by radiograph.

I agree with both the essayist and with Dr. Friesell, that I do not want anything thru the end of the root if I can possibly help it, in filling root-canals for myself or my patients.

Another point which was brought out in the paper I think was added since the

original copy was drafted and sent to me, a day or two ago, was about packing the gutta-percha thoroly, to avoid shrinkage;—he did not say to avoid shrinkage, but he did express the thought of packing the gutta-percha thoroly, and the advantage from it, using pluggers that will pack rather than punch holes in it. If there is such a thing as shrinkage in gutta-percha that is well packed, it would not be an ideal filling material and we certainly would have to look for something else.

We are hearing from different sources, of the porosity of gutta-percha, and that it is not a safe thing unless it is protected at one end with zinc chloride cement. I cannot agree with that. If gutta-percha is packed into a canal—I say gutta-percha, not chloropercha, not a solution of gutta-percha and chloroform, no matter how thick that may be made by constant packing or pumping, but I say if gutta-percha is packed thoroly into a canal, it is just as safe at one end as it is at the other end, and if we ought to protect it with zinc chloride cement at one end, then we ought to protect it with something at the other end. I believe gutta-percha is an ideal filling material. It is up to us to use it and pack it to mechanically fill the space at the apex, and then the rest of the canal will take care of itself.

I like the words of the author, "mental picture," for I believe we must have a mental picture of the canal within the root first, and secondly, a picture of that canal well filled with a dense mass of gutta-percha before it is possible for us to accomplish this result. If we can keep before us an ideal of a perfectly filled root-canal in each individual case, the canal that we are working upon, we will not be satisfied until we see a radiograph of that canal to correspond to our mental picture previously formed.

Root-canal operations are of the most exacting nature and demand the utmost patience, cure and delicacy of manipulation, and in spite of these things, much disappointment is encountered, but the more careful we are and the more patience we are able to exercise, and the more closely we keep to methods of procedure that are practical and efficient, the better and more uniform results will we obtain and the greater benefit will we be able to extend to the vast public demanding this kind of service.

(The discussion was accompanied by the exhibition of lantern slides.)

G. H. Henderson, Chicago, Ill.

I have been studying root-canals for thirty years, and I know less about them today than I did twenty years ago. I have followed Dr. Gethro and Dr. Coolidge here in Illinois for a good many years, and they are men of experience. We know that.

There was one thing Dr. Gethro said that I believe has a great deal to do with this, and that is that when you go thru the country and find teeth filled with the canals open, by men who never put on a rubber-dam,—do you know I have been told lately by men in practice that they never use any dam.

In 1907 I called on 3,000 dentists and more, in their offices, in 12 or 14 states, and I found the same condition. A great many do not use the rubber-dam to any extent. And how men can fill a canal of a tooth without a rubber-dam is beyond me. I admit my brain capacity is sub-normal, that some men have more than 125 or 150 per cent brain capacity but the average dentist is below 100 per cent. We did not pick the men who went into dentistry. They picked themselves. And then they go at this work and try to fill canals in the way they do.

On Tuesday morning we were told that chlora-percha was absolutely no good. That was in the first meeting. Now, in the last meeting we are winding

up with the uses of chlora-percha and eucha-percha. I want to state to you gentlemen that the members of our profession are up a tree. We do not know what to use nor when to use it. When big men, with these 150 per cent brain capacity differ, what are we normal fellows going to do? (Laughter.) I made up my mind day before yesterday that I would not have any more eucha-percha around. What are we going to do? I used to think I could fill canals. I had very little trouble.

I have a molar that was filled thirty years ago next month with cotton taken from an open cotton holder, saturated in creosote, and these three canals filled with it, and it has carried a bridge for thirty years, or has carried four or five bridges in that time, and never given me any trouble.

I do not know what to do with these cases. I believe that my case is an accident. I believe that 90 per cent of the teeth that are filled in the canals and have not given any trouble are accidents. I believe it is an accident when an ordinary root is filled and I believe it is another accident when it is not filled, providing there was about 15 per cent of brain capacity used in the filling of it. But there are the fellows who do not use ten per cent brain capacity when they are filling root-canals. When a man has a chance to put on a rubber-dam and does not do it, he is not using one per cent brain capacity. I think there is one of the troubles that we have.

But let us get down to some form of standardization of filling materials, so that we will get to where the people know what we can use with intelligence. When you get root-canals filled for fifty cents and a dollar per,—and there are about 90 per cent of the canals of this country that per canal are not charged for at more than that,—how in the name of goodness can you expect those canals to be filled properly under those conditions? And you cheap skates, when you go on and think you can fill a canal for a dollar and do a good job, quit dentistry or change your fee (Laughter and applause.) You can not do it. You will not do it, and you don't do it.

I have had a good many X-rays taken of roots since I have been in Chicago this last year, and I only have two that show any sign of being filled to the end, in all that I have had taken. And when you put Pus Cure and all these other cures or fill in the root-canals with heated gutta-percha points, as is done every day, what can you expect? I wish we knew more about filling root-canals. I don't.

Herbert C. Miller, Portland, Ore.

I wish that when these essayists are making comments upon the effects of arsenic in the devitalization of pulps, that they would give us the results of some scientific investigations. (Applause.) Many of us are given to making statements. Doubtless we are sincere in them. But they are lacking in scientific backing. I have been using arsenic for thirty years in the devitalization of pulps, and I have been removing many pulps by the use of anesthesia (?), just as probably every member in this room is doing it, and I believe that I have endeavored to exercise as much care as most of them.

Now, I want to say that clinical experience has proven to my mind,—mind you, I say clinical experience, not scientific investigation,—that there is less trouble resulting from the careful use of arsenic for the purpose of devitalization of pulps than from the removal of pulps in the fresh state, as we are now doing it.

If you are going to use arsenic to devitalize pulps then there is another requirement to follow. There is no advantage in using arsenic to devitalize a pulp if we then immediately undertake to remove that pulp; consider what will

follow. What is the physiological action when tissue becomes necrotic? Consider that for a moment.

I am not telling you anything new. I have had this for twenty or twenty-five years and you have had it, many of you, and many of you have forgotten it. If when we devitalize a pulp with arsenic and the patient returns, we make the usual tests and we are convinced that the pulp is dead, we should fill the cavity temporarily to prevent anything further from entering that tooth and allow it to wait undisturbed for one week.

I want to repeat, before I proceed, the statements of old Dr. J. J. R. Patrick, whom many of you will remember. Twenty-five years ago he said to me, "You are a young man. The best way is to devitalize your pulp with arsenic and then"—we would not think of following his directions, but he said, "leave the tooth open. Let the secretions of the mouth pass in freely and fully. Arsenic is an agent we use to preserve things. Taxidermists are using it to a large extent, and there will be no danger." He said, "Leave it for a week."

He was right when he said leave it for a week, but I think that none of you will agree with him that it should be left open. The tooth must be sealed. We must not permit anything to enter that tooth, except as we place it there.

But now, leave it how long? Leave it eight days after we know that the pulp is dead. What for? For the purpose of permitting the pulp to slough. A tissue that is dead will be thrown off in the course of time.

Now what is producing most of the trouble we are having in the removal of pulps? The tissues that are holding on. And it is with the greatest difficulty that we can remove them in some cases, and where there is more than one foraminal opening, side openings, what assurance have you that you have removed every portion of the pulp extending out thru one of those little side and extra openings? It is very difficult to determine it with the use of the X-ray.

If we devitalize the pulp, if we destroy it, and if there is some other agent or better treatment to use for this purpose than arsenic, well and good; but when the pulp is destroyed, then wait on Nature. In approximately eight days the destroyed tissue will be thrown off so that in many instances all that is necessary is to introduce a barbed broach or a smooth broach with a fiber of cotton upon it, and the pulp is readily entangled and removed. In many instances you will get it all the first time. In some instances, where the tooth was well opened, I have blown the pulp out with the chip or air syringe.

The essayist's treatment of canals in the main I believe to be sound. I believe we all agree with him; but I will say that if a root-canal can be filled, if it is large enough to be filled it is easier to fill when not mutilated. If you have waited until the pulp is all loosened and thrown off, you can withdraw it readily. You will get it all out of the dentin. It is my conviction we are not paying enough attention to filling the tubuli of the dentin. You know how difficult it is to fill the tubuli and if you undertake to fill them you must use some agent that is penetrative and that can be forced into the tubuli.

I would say if the canal is large enough so that our small broaches will penetrate them so that we can measure the full length of the root and determine the apical foramen, if we have developed the finger skill that will enable us to determine just where the apical foramen is, then we can proceed to fill, and we should fill without any mutilation. When the canal is too small, we should follow the technic described by the essayist.

Now as to the materials. I would like, if I may be permitted perhaps a word of

criticism concerning the use of eucalyptol. Eucalyptol is not volatile to the extent that chloroform is. I believe, without making any scientific tests, that chloroform is more penetrating than eucalyptol. And a solution of gutta-percha that is made with chloroform will be more penetrating, and there will be less material to be forced out. We desire that the root-canal shall be filled with gutta-percha and nothing else, but we place the chloropercha or eucalyptol in the canal for lubrication and to remove the air. In talking to my students I tell them they must place first in the canal something to dispel the air, and then we must expel this solution by proceeding as the essayist has directed, to fill that canal with gutta-percha points, and we must condense them, and we must wait and take time to do it, we must make certain that the canal is filled to the end.

I do wish that a larger number of the members of our profession would give a little more attention to the use of arsenic, the careful use of arsenic in the devitalization of pulps, and let us have experiments, scientific experiments, covering this subject, that will mean something to us before we condemn it in a wholesale manner.

Arthur D. Black, Chicago, Ill.

Much as I should like to emphasize some of the points by the essayist in his very splendid paper, I am going to confine my brief discussion to items which were not specifically presented in the paper.

First, I should like to call your attention to certain points in the histology of the structures of the apical portion of the canal, to which the members of the dental profession seem to have given very little attention. There is, as a rule, a very definite constriction of the canal at the dento-cemental junction, and then in the portion of the canal which is formed of cementum, there is a widening out of that canal in the form of a cone. Many radiographs of root-canal fillings show this conical space filled with gutta-percha, which appears in the form of a triangle in the radiograph.

The main point to which I want to call your attention is the fact that there is normally an attachment of the peridental membrane to all portions of this cementum which forms the canal, as it widens out from the dentin to the apex of the root, and in cases in which we have reason to believe that the peridental membrane of this area remains vital, it is very much better to leave it so, rather than to attempt to fill the space and destroy this tissue. The peridental membrane in that area should not be destroyed and that portion of the canal should not be filled in a case in which a vital pulp is removed. The operation should stop at the apex of the dentin in such cases, and not at the actual apex of the root of the tooth.

I think we have not separated sufficiently well two types of cases—the one of which there has been no previous injury to the peridental tissue about the apex, and others in which more or less of this tissue has been destroyed. In the case in which the peridental tissues are intact, the problem is almost purely technical, but in those cases in which the peridental membrane and possibly other tissues about the apex have been destroyed, the pathological changes which have occurred demand first consideration. The placing of a good root-canal filling is secondary.

I have been making extensive radiographic studies of these cases for a number of years, and I wish to refer briefly to one phase of this work. I have classified hundreds and hundreds of radiographs of root-canal fillings, by operators of all grades, grouping those which were considered good and those which were deemed poor, and the results show less than 8 per cent of abscesses in those that appear to be good root-canal fillings, and

67 per cent of abscesses in those in which the fillings were plainly poor. It seems to me that these figures should be a wonderful incentive for the improvement of our technic in these cases, regardless of every other consideration. (Applause.)

In connection with the above figures, we should take into account that an unknown percentage of these cases were abscessed before the root fillings were made, so that those men who are careful have a prospect of less than eight per cent of abscesses following the operation of removing pulps and placing root fillings.

I will speak of one phase of Dr. Coolidge's presentation, because I think he did not make himself clear in the matter of the placing of root-canal fillings in cases where the radiograph showed definite destruction of the apical tissues. I do not believe Dr. Coolidge would care to leave the impression upon this audience, which I am afraid he did, that he would take that chance in all cases presenting abscesses, and then follow them up with radiographs and possibly decide to extract the tooth a year, or two or three years, later.

I would like for him to tell us something about the percentage of cases in which an abscessed area has apparently entirely healed. I have followed the same plan in a number of cases, and I have checked them up with radiographs over a period of years, but I cannot put my finger today on a single one of these cases in which I am sure that it is all right; not a single one. The number must be few, because, if you will take the abscessed teeth that you extract, and will examine the roots of every one after the extraction and see where the detachment of the peridental membrane has been, you will notice mighty few of them in which there has been a detachment on only one side of the root. Most of them involve the entire circumference of the apical end of the root.

However, I do not wish to draw you aside from the one phase of that subject which Dr. Coolidge has presented, and that is that the radiograph is not infallible, and that we may have a cavity in the bone to the lingual side or deeper in the bone than the apex of the root of the tooth, which may not have destroyed the peridental membrane. Nevertheless, we cannot get away from the proposition that when the peridental membrane is destroyed and the surface of the cementum is denuded, there will be no reattachment to it, it makes no difference what you use; ionization will not do it, nothing will do it. It makes no difference if you make it absolutely sterile; the histological elements, necessary to the reattachment, are missing.

I am glad Dr. Miller said what he did about the facts to prove the case. Most of my discussions of recent years of this subject have been negative, because I felt I knew more about it from that side. We have not had a presentation to the dental profession of a scientific investigation of the root-canal and chronic abscess problem by any man or by any group of men which can today possibly form a rational basis for the treatment of these conditions, and no single man, nor small group of men can do it, because we need more evidence than one man or a small group of men can give. A single man or a small group of men may direct it, but it must be participated in by a very considerable number, so that we can get the facts. We must undertake the study of these problems on the same basis that a serious problem in medicine is studied, on the basis of case histories.

We must have a large enough number of men who will make definite records of the conditions, both by radiographic and by other examinations, when these cases present, and then follow the cases thru with records, both radiographic and otherwise, until they have accumulated enough data to establish the basic facts.

Nobody is going to settle the problem

of the use of arsenic in teeth until this has been done. It may be Dr. Gethro's opinion that you should not use it. It may be Dr. Miller's opinion that you ought to use it in every case; but neither one of them knows, because he has not the facts to prove his case. When we have enough men working together, who will report fully on several thousand cases in which arsenic has been applied to devitalize pulps, and followed by radiographic examinations over a sufficient period, and several thousand more in which cocaine has been employed, the facts may be determined. It will take some years to do it, but it must be done. (Applause).

F. D. Miller, Altoona, Pa.

There seems to be an impression that rosin, chloropercha, and euca-percha are root-canal filling materials. I want to emphasize the fact that those materials are not root-canal filling materials. Gutta-percha is the only root-canal filling, I believe, that is standard today, and the use of either eucha percha, eucalyptol, rosin, or chlora percha is merely to facilitate the introduction of the base-plate gutta-percha.

In regard to the point that chloropercha is porous,—it is the most natural thing in the world that it would be, because there would be evaporation of the chloroform and the remainder is not chloropercha, but gutta-percha, I think that the most beautiful illustration of the fact that gutta-percha is impervious to moisture and not porous, is the fact that one of the first trans-Atlantic cables, which was laid in 1880, is still in active service, (and gutta-percha is the covering used on about 90% of all undersea cables). If there was any porosity of the gutta-percha, I feel quite sure that these wires would not be working as they are now. *Chloropercha* is merely to *facilitate the introduction* of the base-plate gutta-percha, which must be packed in an *absolutely homogeneous mass,* and fill every crevice and every particle of the root-canal.

Another point about the interpretation of radiographs, and the apparently good or fairly good root-canal fillings. I do not believe that there is *any such thing* as a fairly good root-canal filling. It is *either* a perfect root-canal filling or an imperfect root-canal filling. There cannot be any half way measure about it. You cannot say that you have a fair root-canal filling, because the result of the operation must either leave that tooth so that reinfection is impossible, else it is a failure. The entire root must be filled thru to the apex and to the pulp chamber, with a *solid homogeneous mass of base-plate gutta-percha.*

A Member: I wish to ask the question if Dr. Black can give us any information as to the material used in those fillings of which he said only 8 per cent showed any evidence of abscess.

Dr. Gethro (Closing the discussion:) I knew we would get a good discussion, because this subject always brings it out, and I very wisely said I think, that much of it was a matter of opinion, and it is a question of your accepting the opinion of one man or that of another, or that of one group of men or that of another group.

There are very few statements that can be made with certainty. That of course applies to arsenic. It is only an opinion, but it is an opinion of many of the better men, and of many of the men who have used arsenic for a great period of years.

I can only tell you of what will happen when you use arsenic. Perhaps many of you may remember that many years ago operators used arsenic for sensitive cavities where there was no opening, where the pulp was normal, a little arsenic was placed in the cavity to desensitize it, and it worked admirably. It will do the same thing today. Those

teeth may be filled with comparative comfort to the patient. What happens in those cases? Not in the next week, possibly not in the next month, but in the future those pulps die, and in most cases or in many of those cases abscesses form. Why? Can you believe when you see the result of that, that arsenic is self-limiting?

I have not positive evidence that arsenic is not self-limiting, but I believe, and many believe that it is not self-limiting. It has not the intelligence to stop at the end of the root and not destroy beyond the end of the root. I would say that if you do use arsenic, you should use it for a limited period and for a very few hours, so that you will not get the bad effects that may come from the effect of the arsenic going thru into the tissues beyond the end of the root.

I do not think you need pay very much attention to the claim that is made that it can be removed easily. I do not think we want to look for those pulps that will jump out or be blown out with air, or by any other method. What would you think of a surgeon if he said that he would take that appendix out, that he would take it out by placing arsenic there and let it slough away? What would you think of a surgeon who would use arsenic on your bones and treat them in that way? Surgical interference, quickly and properly done, is the ideal method, so far as I see it. (Applause).

I am going to be very brief, for there are other points. One might talk for hours on this. The smaller the foramina, the safer the filling. There is no question about that particular point.

Mention was made about the cotton holder. I cannot help taking one fall out of that. The man who has a cotton holder on his operating table, as we see it in many of the offices, and uses that as his base of supply for cotton going into root-canals, is committing what I think is a crime in his profession. There is no excuse in the world for using cotton, that is as bad as cotton that is out in the air. I would not use cotton in that form. Better not use it at all.

I am sure Dr. Coolidge would not say to you that these cases that he has shown you very beautifully, as far as root-canal filling is concerned, and he has followed it up for sometime,—he would not tell you with any degree of positiveness that absorption has not occurred even at this particular time. There might have been and probably was a rebuilding of bone, but nobody can say how long that is going to last.

I am going to close by leaving one thing with you: If there is any lesson that we have learned in this, it is the lesson of preventive dentistry. We should know that this is a very uncertain process, and that the man who is practicing preventive dentistry is practicing what he should be doing for his patients.

I thank you very much.

PHYSIOLOGICAL FACTORS AS RELATED TO THE PERIDENTAL MEMBRANE, CEMENTUM AND BONE IN TOOTH MOVEMENT.

By Martin Dewey, D. D. S., Chicago, Ill.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

IN CONSIDERING the physiology of the supporting structures of the tooth which may be said to consist of the alveolar process, the peridental membrane and the cementum, we can best arrive at those functions by considering briefly some of the embryological factors concerned in the development of those parts. The alveolar process belongs to that group of bones which are known as intramembranous bones, because they are primarily laid down within the mesoblastic embryonic tissue. The alveolar process has been developed for the sole purpose of supporting the tooth and consequently is subservient to the wish of the tooth. Wherever the tooth erupts, the alveolar process develops to support that tooth as a result of the mechanical stimulation produced by the development of the tooth and such other forces as are brought to bear upon it during the life of the individual.

In the individual, the alveolar process is composed of a compact plate covered with periosteum, which forms the labial and lingual portion of the process and a compact plate which lines the socket of the tooth which is covered by the peridental membrane. In between these plates we have a cancellous arrangement of bone, the spaces of which are filled with medullary tissue, otherwise known as bone marrow, which consists of various types of cells, the most important of which is the mesoblastic embryonic cells and osteoblasts, which are concerned in the future development of the bone. In considering the physiology of the alveolar process, we have to remember that the alveolar process develops and is repaired by the action of the osteoblasts which are found in the lacuna of the bone and in the medullary spaces. We have to discard the old theory that the peridental membrane and the periosteum had an osteogenetic function and were capable of repairing bone. All bone development comes from preexisting osteoblasts or from mesoblastic embryonic cells and any repair or change which occurs as a result of tooth movement occurs as the result of these cells acting in conjunction with the osteoclasts and round cells which produce bone absorption. In pathologic conditions where there has been an absorption of the alveolar process, such a repair of the process as is obtained will be from the action of the osteoblasts in the adjoining healthy alveolar process and not from any osteogenetic function of the peridental membrane or periosteum. We may truly consider that the osteoblasts rush out into the pocket produced by the pathological condition and therein deposit bone which carries on repair produced by the immediate action of those cells. The function of the peridental membrane is wholly that of a physical function so far as the alveolar process and cementum is concerned. The peridental membrane is a thin in-elastic connective tissue membrane which forms the medium of attachment between the alveolar process and the cementum of the tooth. The attachment of the peridental membrane to the alveolar process is produced by the osteoblasts developing bone around the preexisting fibers and binding it into the bone, very similar to the manner in which reinforced concrete rods are fastened into a cement wall. On the cemental side the same action takes place

because the cementum develops from the basalay layer, and the cement lacuna lay down a layer of cementum on the dentin and thereby catch the ends of the fibers which are in apposition to the dentin. The peridental membrane has been developed from the connective tissue fibers which made up what in embryonic life is known as the dental sac, and these fibers have been increased as the result of physiological stress brought to bear on the crown of the tooth after the tooth had erupted.

The physiology of the cementum is purely that of a means of attachment between the fibers of the peridental membrane and the dentin. The cementum develops as an independent calcified tissue laid down on the dentin, and in no way is the cemental forming power dependent either upon the dentin or the peridental membrane. The older text books contain the statement that cementum was developed from the peridental membrane, or from cementoblasts which the natural habitants of the peridental membrane covering the roots of the tooth. Later investigations have failed to substantiate that theory, and by careful study we are forced to admit that there is no evidence to substantiate the belief that the peridental membrane is in any way concerned with the development of the cementum. From an examination of the cementum in various stages of development, and from a study of cross sections of the teeth in adult individuals everything points to the fact that the cementum is an independent calcified tissue, just as separate and distinct from the peridental membrane as bone is separate and distinct from the periosteum.

Repair of the cementum therefore occurs the same as the repair of bone, namely, by the escape of the cementoblasts from preexisting cementum, thereby forming a new layer of cementum, the same as bone is formed in repair of fractures. From our present knowledge we can state that the alveolar process and cementum both are subject to extensive repair from injury, providing the pathologic conditions can be removed. A large amount of clinical evidence has been collected to show that large pockets in the alveolar process of roots of teeth will be refilled with alveolar process and repaired by cementum, providing the parts are healthy. Some of the most beautiful specimens of the development of the alveolar process which I have ever seen were specimens which were furnished me by Dr. Frank C. Pague, of San Francisco.

In closing, we will state that the large amount of evidence collected from the histological and clinical standpoint at the present time points very strongly to the fact that the physiology of the alveolar process is such as is very favorable for extensive repairs, both from pathologic conditions and traumatic injuries, and will respond to the proper application of force in the movement of teeth.

The peridental membrane is simply a physical structure holding the tooth in contact with the alveolar process and the gum tissue. This second function of the peridental membrane in holding the gingival tissue tight around the neck of the tooth is one which must be very carefully considered and more importance must be given to it in the future than has in times past.

The cementum is a separate calcified tissue developing specialized mesoblastic cells covering the dentin of the tooth and binding the ends of the peridental membrane into the cementum, thereby forming a means of attachment between the dentin and the peridental membrane.

When the separate and distinct function of each of these three tissues is considered, and that each one to a certain extent is independent histologically of the other from the developmental standpoint, much clearer clinical knowledge can be obtained than has been in the past when the peridental membrane was considered to be the source of development for both the osteoblasts and cementoblasts.

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LIBERATION OF ANTIBODIES ON INJECTION OF FOREIGN PROTEINS.

By Siegfried F. Herrmann, Minneapolis, Minn.

(Researches Conducted Under the Auspices of the University of Minnesota and the Research Institute of the National Dental Association.)

MANY reports have been published concerning the treatment of acute and chronic infections by the intravenous injection of foreign proteins. This treatment has been applied to typhoid fever, arthritis, and certain skin diseases. It apparently developed as an outgrowth of the injection of vaccines. Vaccine therapy, once the great hope of modern therapeutics, failed to produce the promised results, and, with the exception of prophylactic vaccination against typhoid, variola, rabies, and perhaps in acne and allied pyogenic skin diseases, was being abandoned more and more. Now there is an apparent revival of allied therapeutic methods in the form of foreign protein injections.

The beginning of foreign protein therapy dates back to the work of Fraenkel[1] in 1893, who treated 57 cases of typhoid fever with subcutaneous injections of typhoid vaccine. He reported that most of the cases were favorably modified, and that a few terminated by rapid lysis. This use of typhoid vaccine during the active, acute stage of the disease was a new departure, which demanded further investigation.

Rumpf,[2] using a vaccine of Bacillus pyocyaneus, repeated the work in another group of cases, and observed equally favorable results.

Ichikawa,[3] using intravenous injections of sensitized vaccine, and Kraus and Mazza,[4] using polyvalent vaccine, were able to produce favorable modifications in 60% of their cases. They also observed equally good results in paratyphoid and found that colon vaccine could be substituted for the typhoid vaccine.

More recent work on typhoid has been reported by Lüdke[5] with albumoses;

[1]Deutsch. med. Wchnschr., 1893, 19, p. 985.

[2]Ibid., 1893, 19, p. 987.

[3]Ztschr. f. Immunitätsforsch. u. exper. Therap., 1914, O., 23, p. 32.

[4]Deutsch. med. Wchnschr., 1914, 40, p. 1556.

[5]München. med. Wchnschr., 1915, 62, p. 321.

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Saxl,[6] using a solution of caffein and camphor; Kibler and McBride,[7] using typhoid vaccine, etc.

Foreign protein has been used also in the treatment of arthritis. Notable is the report of Miller and Lusk.[8] Miller later summarizes his results and gives an extensive bibliography of work done by other clinicians.[9] The results as reported appear promising, especially in acute arthritis.

Other favorable results have been reported in skin diseases, puerperal sepsis, conjunctivitis, iritis, trachoma, typhus, tuberculosis, etc. Among the variety of proteins employed are: colon vaccine, chicken serum, whole blood, proteose, albumose horse serum, and autolyzed vaccine.

Closely related to the response to foreign protein is the old and familiar observation that a specific disease may sometimes improve with the advent of some intercurrent infection. For example, the symptoms of acute gonorrhea have been observed to subside with the incidence of typhoid fever. Attention has also been called to the increased resistance of the body to various common infections, following any vaccine injection.

It is evident that foreign protein therapy is empirical and non-specific. Almost any foreign protein seems to be effective, and may be employed more or less successfully, under suitable conditions, in a variety of diseases. The question arises as to what factor is responsible for the apparent benefits observed. If this manner of treatment is to be placed on a scientific basis this factor must be determined. Clinical investigations have thrown no light on this question. The type of reaction is apparently the same in all cases.

As described by Kibler and McBride[7] the reaction of a typhoid patient to the intravenous injection of typhoid vaccine is as follows:

1. Temperature.—Within a few minutes to 1 hour after the injection a chill occurs, lasting 20-30 minutes. This is followed by a rapid rise of temperature which later falls abruptly, and then tends to remain remittent in favorable cases.

2. Leukocytes.—Usually there is an early leukopenia within 4 hours, due mainly to a disappearance of polymorphonuclears. Within about 12 hours this is followed by a moderate polymorphonuclear leukocytosis.

3. Blood pressure is usually decreased by 10-15 mm. after the chill.

4. Coagulation Time.—Only slight and insignificant changes have been observed.

5. Antibodies.—No essential difference from the specific response to the injection of typhoid antigen in a normal individual was observed in these typhoid patients. It is to be noted, however, that conditions here differ somewhat from those in which an heterologous protein is injected.

The reaction in arthritis cases agrees essentially in the first four particulars with the reaction in typhoid fever. The antibody response will be considered later. Most clinicians seem agreed in regarding the severe chill as the most important factor in this reaction. It is evident that a chill alone cannot be responsible for the marked relief from pain and for the remission in the course of an acute arthritis. It is possible, however, that the resulting hyperpyrexia may have an effect in favoring immune reactions and antibody production.

Rolly and Meltzer,[10] in a study on the effect of high temperatures, injected a series of rabbits with small doses of typhoid bacilli or cholera vibrios. Some of these rabbits were kept in an oven so that their body temperature remained between 40 and 42C. The controls were kept at ordinary room temperature. They observed a higher average production of agglutinins and lysins in the high temperature rabbits than in the controls. They also showed that phagocytosis by human leukocytes in vitro occurs at its optimum between 37 and 40 C.

More recently, Winslow, Miller and Noble[11] investigated the effect of moderately high temperatures on the production of lysins against sheep blood corpuscles. They kept their rabbits in an oven at a moderately high temperature, 29 to 32 C. Injections of sheep cells were given and the hemolytic titer estimated each week. They found that

[6]Wiener med. Wchnschr., 1916, 66, p. 115.
[7]Jour. Infect. Dis., 1917, 21, p. 13.
[8]Jour. Am. Med. Assn., 1916, 66, p. 1756 and 1916, 67, p. 2010.
[9]Miller: Jour. Am. Med. Assn., 1917, 69, 765.
[10]Deutsch. Arch. f. klin. Med., 1908, 94, p. 335.
[11]Proc. Soc. Exper. Biol. and Med., 1916, 13, p. 93.

the rate of lysin production in the heated rabbits was slower than that in the controls.

These experiments may indicate that a moderately high temperature lowers the general vital resistance to a beginning infection. Once an infection is established, however, according to Rolly and Meltzer's results, hyperpyrexia may bring about a greater production of antibodies.

If a specific leukocytosis could be observed, one might think that this would be a factor in overcoming the infection, but the degree of leukocytosis seems only to parallel the severity in each case.[12] Gay and Claypole [13] believed that a specific hyperleukocytosis occurred in typhoid immune rabbits, following injections of typhoid bacilli, but McWilliams[14] later showed that both normal and immune rabbits respond to about the same degree. The leukocytosis therefore cannot be regarded as specific.

The slight variations in blood pressure and coagulation time are evidently insignificant.

We pass now to a consideration of the antibody response. Very little work on this aspect of the question has been done, yet it seems as if the explanation of a therapeutic response, in the case of any infection, to the injection of a substance not specifically bactericidal to the infecting organism, should logically be sought in the liberation of specific antibodies against that organism. Ordinarily when the body overcomes a streptococcic infection, for example, we believe this is accomplished by the production of antibodies against the streptococcus. Why, then, should we not suspect that the therapeutic effect of foreign protein injections in infections, obviously not due to the foreign protein per se, has as its basis the liberation of specific antibodies against the causative organism? In the case of arthritis we believe that the symptoms persist because the antibodies which should normally be produced are for some reason not liberated.

In the light of Ehrlich's receptor theory, we recognize three distinct phases in the production of antibodies: (1) the sensitization of the tissue cells; (2) an overproduction of sessile receptors; (3) the liberation of these receptors from the cells. A perfect antigen is one which causes all of these phases to be completed. It seems a plausible hypothesis that in those cases of arthritis, etc., which show a rapid therapeutic response to injections of foreign protein, the etiologic organism is acting only as an imperfect antigen. It sensitizes the cells and causes sessile receptor production, but does not give the necessary stimulus to cause these receptors to be thrown off. The foreign protein then supplies this stimulus, the system is flooded with specific antibodies, and a remission of the infection results. Altho a variety of proteins may serve to complete this second phase, the reaction is still absolutely specific, since there must be a specific stimulation of cells, and a final liberation of specific antibodies.

In this connection I would recall the experiments of Bruck.[15] According to Ehrlich's theory a molecule of tetanus toxin is composed of a haptophore group, which unites with the cell receptor, and a toxophore group, which is responsible for the poisoning of the cell. This toxophore group can be destroyed by various methods such as heat, light and long preservation. The toxin has then become a toxoid. The haptophore group can still unite with a sessile cell receptor, or with a specific antibody, but because of the absence of the toxophore group the molecule has become innocuous. Bruck injected rabbits with small repeated doses of such a toxoid. The rabbits were found to produce very little, or no free antitoxin, the amount being dependent on the amount of effective toxophore groups which still remained in the toxoid. He further showed that rabbits injected with tetanus toxoid, during the first few succeeding hours possessed a greater tolerance for tetanus toxin, but that later they showed an actual hypersensitiveness, being killed by only a fractional portion of the ordinary lethal dose of toxin.

[12]Cross: Journal—Lancet, 1917, 37, p. 764.

[13]Arch. Int. Med., 1914, 14, p. 662.

[14]Jour. Immunol., 1916, I, p. 159.

[15]Ztschr. f. Hyg. u. Infections-Krankh., 1904, 46, p. 176; 48, p. 113.

These results Bruck interpreted as follows: The haptophore group of the toxoid at first is anchored to the specific cell receptor. The toxin molecule introduced soon afterward, therefore, cannot reach the cell, since all the receptors are blocked. Later, however, an overproduction of sessile receptors occurs, and a hypersensitiveness to toxin results, since the avenues of approach to the cell are increased many times. The toxoid has acted as an inferior antigen. It has brought about the first and second steps of antibody production, namely, (1) sensitization of cell receptors, and (2) the overproduction of similar sessile receptors, but it has lacked the necessary stimulus to cause the discharge of these receptors. Had the rabbits been immunized with small doses of unchanged toxin this third stage would have been completed. Bruck therefore sees in the toxophore group the necessary stimulus for the setting free of the receptors. Might not a foreign protein, in an analogous way, supply such a stimulus? It was with this hypothesis in view that I undertook an investigation of the effect of foreign protein on antibody production. The experiments have been conducted entirely with rabbits, because all the factors can thus be much more accurately controlled than in a purely clinical investigation.

Several other investigations have been reported which touch on the immune reactions in foreign protein therapy.

Jobling and Petersen[16] report a "mobilization of ferments," notably protease and lipase, following foreign protein injections. Later[17] they point out an "increase in antiferment," dependent on "highly dispersed, unsaturated lipoids," and conclude that "the main therapeutic factor is probably an increased dispersion of colloids."

Culver[18] investigated the opsonin and lysin content in the serum of patients with gonorrheal arthritis, after intravenous injections of gonococcic vaccine and proteose. He reports a rise in titer of these antibodies.

Bull[19] reports a rise in the antibodies of typhoid immune rabbits after the injection of typhoid bacilli; but his results could not be confirmed by Teague and McWilliams,[20] who suggest a new theory to explain the therapeutic effect on cases of typhoid, of intravenous injections of typhoid vaccine. On the supposition that blood serum is more bactericidal than lymph, they base the theory that the vaccine causes a greater flow of bactericidal serum into the lymphoid organs, and thus overcomes the local infection. It does not appear that this theory has been substantiated.

On the basis of the hypothesis that the foreign protein reaction serves as a stimulus to set free specific antibodies, I first investigated opsonins, for the streptococcus. This organism is notably a poor antigen, in that it is difficult to obtain a high antibody titer against it. An animal sensitized with this organism should therefore be a favorable subject for the liberation of anti-bodies by foreign protein.

Series 1.—Two rabbits were injected intravenously at 3-day intervals with 1 c c of a fresh suspension of killed streptococcus viridans. The organism was grown on blood agar slants, and a 24-hour growth washed off with 10 c c salt solution. This emulsion was heated at 60 C. for 1 hour to kill the bacteria, and 1 c c of this vaccine used as a dose. A fresh vaccine was made each time. The fourth injection consisted of ½ c c of living streptococci. Five days later the opsonic index was determined, and 2 c c of human ascitic fluid injected intravenously.

The method of determining the opsonic index was that of Wright, using the experimenter's own leukocytes and serum as a standard.

Both rabbits were found to have a very low opsonic index 5 days after the fourth injection of streptococci; 2 c c of human ascitic fluid were then injected, and a marked rapid rise of opsonins occurred, the total increase being 700% in 48 hours. Apparently the foreign protein acted as an effective stimulus to liberate sessile receptors.

After 18 days the opsonic content was again found to be at a low level. Two further injections of streptococci were then given. This time an interesting variation in response occurred. The opsonic index of Rabbit 17 rose, while that of Rabbit 311 continued to fall. In the former the streptococci evidently acted

[16]Jour. Am. Med. Assn., 1915, 65, p. 515.
[17]Ibid., 1916, 66, p. 1753.
[18]Jour. Lab. and Clin. Med., 1917, 3, p. 11.
[19]Jour. Exper. Med., 1916, 23, p. 419.
[20]Jour. Immunol., 1917, 2, p. 185.

as a perfect antigen, causing all three stages of antibody production, while in the latter the final liberation of antibodies did not take place. This supposition was confirmed by the effect of an injection of ascitic fluid. In Rabbit 17 there stimulus to cause the cells to throw off these receptors.

Series 2.—In this series 2 rabbits were injected with fresh suspensions of meningococci, and human serum was used as foreign protein. Rabbit 395 received 2

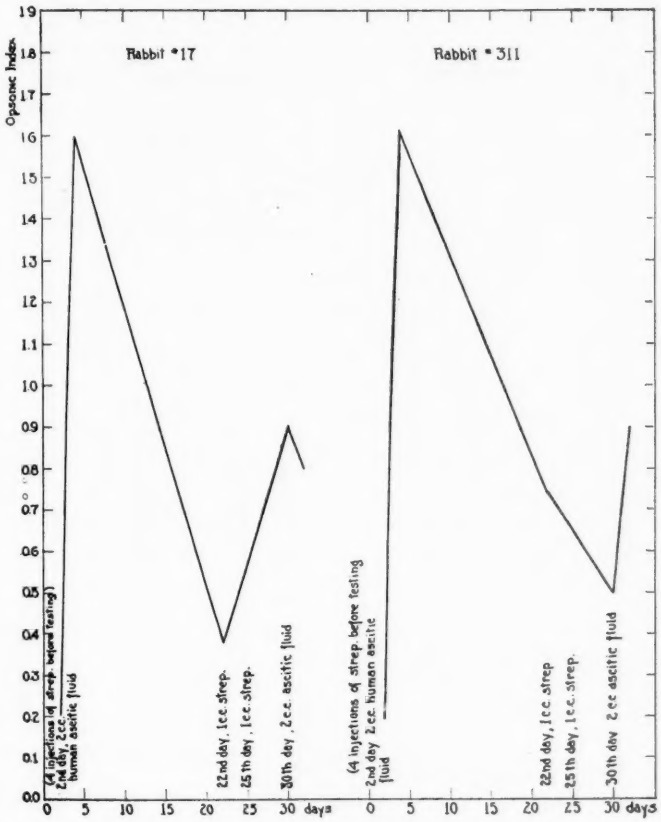
Opsonic Index
Rabbit *17
Rabbit * 311
(4 injections of strep. before testing)
2nd day 2 cc. human ascitic fluid
22nd day, 1 cc. strep.
25 th day, 1 cc. strep.
30th day, 2 cc. ascitic fluid
(4 injections of strep. before testing
2nd day 2 cc. human ascitic fluid
22nd day, 1 cc. strep
25 th day, 1 cc. strep.
30th day 2 cc ascitic fluid
days

Chart 1 (Series 1.)—Opsonins for streptococcus.

resulted no further increase in opsonins. The stimulus of the antigen had been sufficient to liberate all antibodies. In Rabbit 311 a rapid liberation of opsonins followed the foreign protein injection. In this case we picture the tissue cells as loaded with an overproduction of specific sessile receptors. The foreign protein reaction then acted as an effective injections of serum with a resulting rise after each injection. Apparently the cells were not completely desensitized by the first serum injection. Rabbit 268 received no second injection and showed a gradual decrease in opsonins.

In order to demonstrate whether these antibodies were specific for meningococci, and also as a control of the technic, the

serums were also tested each time for opsonins against B. typhosus. The typhoid opsonic index remained low and unchanged thruout.

Series. 3.—Two rabbits were given 4 day following, while the opsonic index of the latter remained stationary. The control test for B. typhosus remained unchanged in both cases.

During the next 40 days 4 injections of

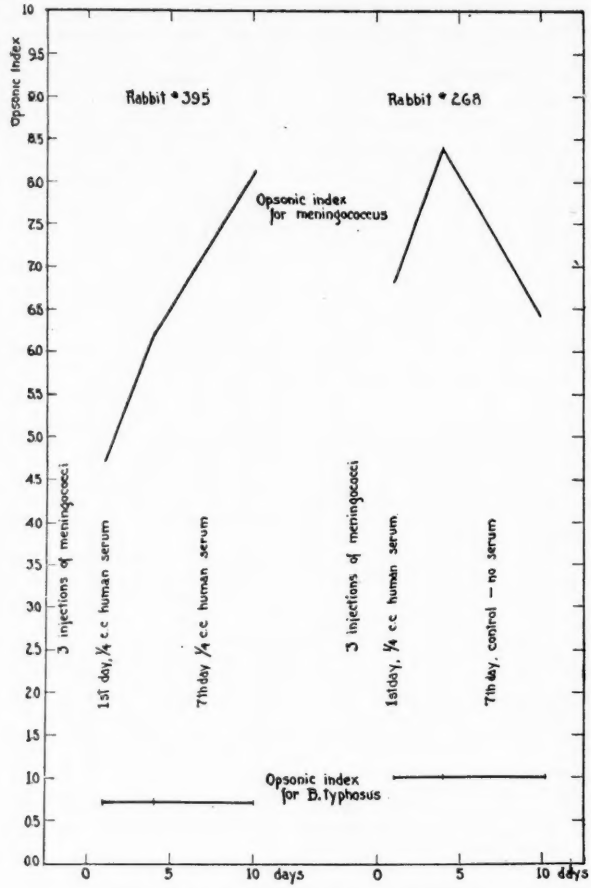

Chart 2 (Series 2.)—Opsonins for meningococcus.

intravenous injections of S. viridans at 3-day intervals, as in Series 1. Six days after the fourth injection the opsonic index was determined. Rabbit 31 then received 1 c c of human serum intravenously, while Rabbit 32 was used as a control and received no serum. The former showed a rise of 38% on the third a dextrose broth culture of streptococcus were given. Six days after the last injection the opsonic index was again determined. It was found lowered in both rabbits. Rabbit 32 then received 1 c c of human serum. There followed a rise of nearly 300%. Rabbit 31 showed a spontaneous rise, but to a much less

degree. A check opsonic determination for meningococci showed no variation.

It was now thought that if an increase in opsonins occurred, following foreign protein injection, it should also be possible to demonstrate a simultaneous rise in the agglutinin titer for streptococci.

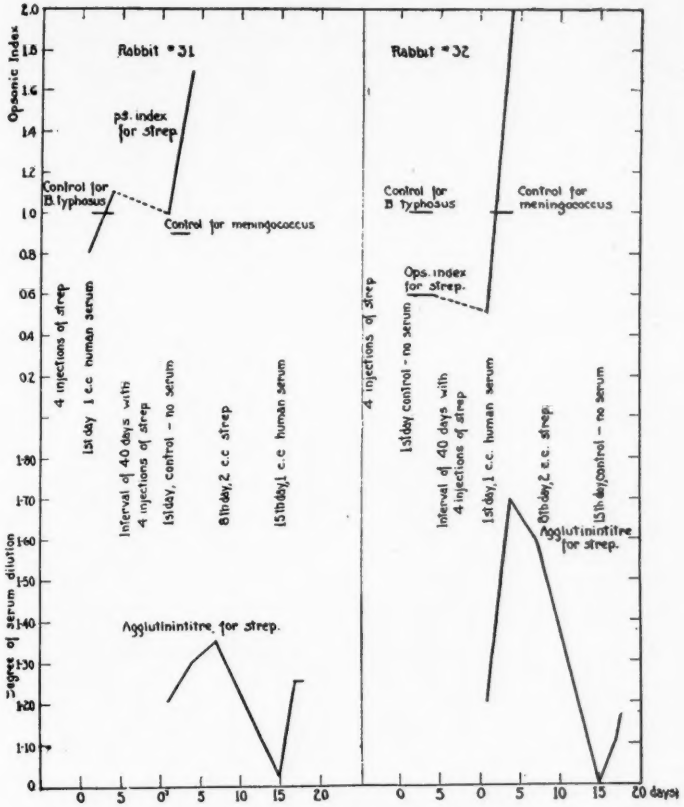
Opsonic Index
Rabbit #31
ps. index for strep
Control for B typhosus
Control for meningococcus
4 injections of strep
1st day 1 c.c. human serum
Interval of 40 days with 4 injections of strep
1st day, control - no serum
8th day, 2 c.c. strep
15th day, 1 c.c. human serum
Agglutinintitre for strep.
Rabbit #32
Ops. index for strep.
Control for B typhosus
Control for meningococcus
4 injections of strep
1st day control - no serum
Interval of 40 days with 4 injections of strep
1st day, 1 c.c. human serum
8th day, 2 c.c. strep.
15th day control - no serum
Agglutinintitre for strep.
Degree of serum dilution
days

Chart 3 (Series 3.)—Opsonins and agglutinins for streptococcus.

The agglutinin titer was determined by the microscopic method as follows: The rabbits were bled from the ear veins, the blood allowed to clot, and the serum separated by means of rapid centrifuging. Varying dilutions of the serum were then made in 0.9% salt solution. Hanging drop preparations were made by placing on a coverslip, with a small platinum loop, 1 drop each of diluted serum and of a 15-hour dextrose-broth culture of streptococcus. The coverslips were then inverted on vaselined hollow ground slides, and left at room temperature. Readings were then taken under the microscope at the end of 3 hours. Positive agglutination could be observed in the lower dilution, consisting of definite clumping of the streptococcal chains. The highest degree of dilution in which a positive test occurred was recorded as the agglutinin titer.

The first tests were made simultaneously with the last opsonic determinations. In response to the first serum in-

jection Rabbit 32 showed a rise in agglutinin titer of 250%. Rabbit 31, which served as a control at this time, also showed a slight rise (50%) and continued to rise gradually. The agglutinin titer of Rabbit 32 began to fall after the third day. All the sessile receptors apparently had been freed by the foreign protein injection, while in Rabbit 31, without the stimulus of foreign, protein, they were liberated to a less degree and more slowly.

In order to resensitize the tissue cells 2 c c of broth culture were now injected. Seven days later the agglutinin titer had fallen very low in both rabbits. This time Rabbit 31 received 1 c c of human serum, while Rabbit 32 served as control. A rapid rise of agglutinin titer occurred in the former which then remained stationary. In the control rabbit a more gradual rise occurred. Thus the specific response to the foreign protein injection was again observed.

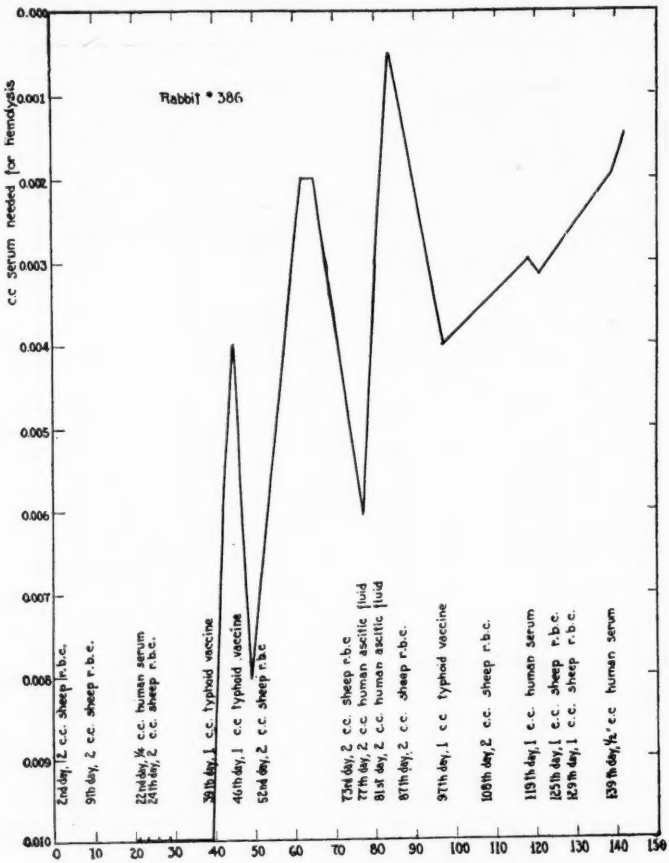
Rabbit * 386
c.c. serum needed for hemolysis
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
0.010
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
2nd day, 2 c.c. sheep r.b.c.
9th day, 2 c.c. sheep r.b.c.
22nd day, ½ c.c. human serum
24th day, 2 c.c. sheep r.b.c.
38th day, 1 c.c. typhoid vaccine
46th day, 1 c.c. typhoid vaccine
52nd day, 2 c.c. sheep r.b.c.
73rd day, 2 c.c. sheep r.b.c.
77th day, 2 c.c. human ascitic fluid
81st day, 2 c.c. human ascitic fluid
87th day, 2 c.c. sheep r.b.c.
97th day, 1 c.c. typhoid vaccine
108th day, 2 c.c. sheep r.b.c.
119th day, 1 c.c. human serum
125th day, 1 c.c. sheep r.b.c.
129th day, 1 c.c. sheep r.b.c.
139th day, ½ c.c. human serum

Chart 4 (Series 5.)—Lysins for sheep cells.

Series 4.—It now became necessary to investigate whether or not foreign protein injections would serve to bring about a mobilization of anti-bodies against an

organism which was known to be a good antigen, that is, one which when injected into an animal, would readily cause the production of a high titer of free antibodies. The typhoid bacillus is known to be such a perfect antigen, when injected into rabbits. Indeed, it is not unusual to obtain an agglutinin titer against typhoid as high as 1:500,000 dilution.

Two rabbits were injected repeatedly with emulsions of typhoid bacilli, until they showed an agglutinin titer of 1:50, on testing by the macroscopic method; 1 c c of guinea-pig serum was then injected and the agglutinin titer again determined in 48 and 72 hours. No rise in titer was apparent.

Further injections of typhoid bacilli were then given until the agglutinin titer reached 1:100. Then ½ c c of human serum was injected. Again no increase in agglutinins could be observed during the next 72 hours. A second injection of human serum did not change the titer.

In order to check these negative results 2 more rabbits were immunized with typhoid bacilli. After 2 injections of bacilli the agglutinin titer was found to be zero, by the microscopic hanging drop method, as described under Series 3; ½ c c of human serum was then injected, and the antibody titer again determined on the third day following. Again no agglutinins were found. Evidently the rabbits had not yet been sufficiently sensitized against the bacilli.

Immunization with typhoid bacilli was then continued until the microscopic method revealed an agglutinin titer of 1:3,000. Two c c of human ascitic fluid were then injected intravenously. No rise in agglutinin content resulted.

The serum of these rabbits was also tested for complement fixing bodies, with the idea in mind that the foreign protein reaction might possibly bring about a liberation of such antibodies, altho it apparently had no effect on the agglutinin content.

As an antigen in the complement fixation test an old suspension of typhoid bacilli in salt solution, to which 0.3% tricresol had been added, was used. The test was carried out with the usual technic, using this typhoid antigen, washed sheep blood cells, fresh guinea-pig complement, and rabbit amboceptor. The serum of the typhoid immune rabbits was inactivated by heating at 56 C. for ½ hour, then diluted, and the fixing power of a given quantity tested. It was found that the ability of the inactivated serum to fix complement was not changed in the slightest degree by foreign protein injections.

We must conclude that foreign protein injections have no effect on the antibody production in typhoid immune rabbits. The typhoid bacillus in apparently a perfect antigen in rabbits, and no foreign protein is needed to stimulate the liberation of antibodies against it.

How, then, can we reconcile this with the apparent therapeutic benefits observed in some human patients? May it not be possible that some patients do not react completely to the antigenic stimulation of the typhoid bacillus? In such cases the foreign protein might well serve as a stimulus causing the sensitized cells to throw off their sessile receptors. This sudden flooding of the system with antibodies might then be responsible for the remission in the disease. This hypothesis seems to be supported by the succeeding series.

Series 5.—Thus far I have recorded observations on opsonins and agglutinins. It seemed desirable also to investigate the response of a third type of antibodies, lysins, to foreign protein injections. Since it is difficult to make accurate determinations of the lysin content of a serum for a specific bacterial cell, we decided to use as our antigen, washed sheep corpuscles. A hemolytic titer can be very accurately obtained, while a bacteriolytic titer, obtained by the method of extinction and plating, is modified by too many possible errors of technic.

It is well known that rabbits will readily produce lysins against sheep corpuscles. Common use is made of this fact in producing amboceptor for the hemolytic system of the Wassermann reaction. We may say, therefore, that sheep cells act as a good antigen when injected into rabbits. This would allow us to predict, on the basis of the preceding series, that foreign protein injection into rabbits sensitized against sheep cells would have little effect on the liberation of specific lysins. It has, however, been frequently observed in this laboratory that a great variation exists in the readiness with which different rabbits will produce amboceptor when injected with sheep cells. Rubinstein[21] recently studied the hemolytic titer of rabbits after 3

[21]Campt. rend. Soc. de biol., 1917, 80, p. 908.

injections of sheep red cells. The titer was determined before each injection, and 7 days after the third. He found that of 11 rabbits only 8 showed a definite marked rise in lysins after each injection. In one of the remaining 3 the titer remained the same, and in the other 2 there was even a decrease in lysin content after successive injections. In such rabbits as the latter 3 the sheep cells evidently acted only as an inferior antigen, and in such cases we would expect, on the basis of our previous work, to be able to liberate antibodies by means of foreign protein injections.

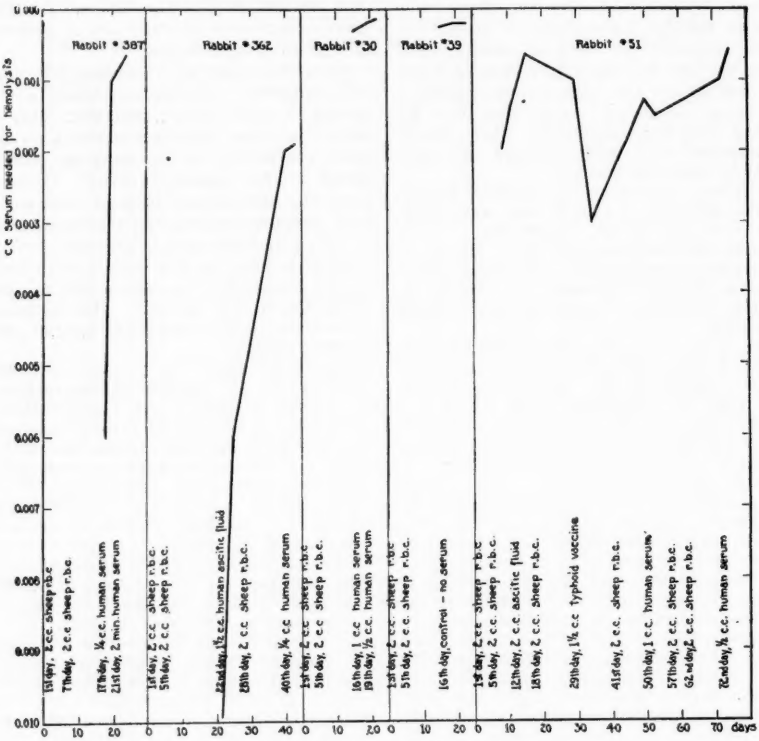
Rabbit • 387
Rabbit • 362
Rabbit • 30
Rabbit • 39
Rabbit • 51
c c serum needed for hemolysis
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
0.010
1st day, 2 c.c. sheep r.b.c
7th day, 2 c.c. sheep r.b.c.
17th day, ¼ c.c. human serum
21st day, 2 min. human serum
1st day, 2 c.c. sheep r.b.c.
5th day, 2 c.c. sheep r.b.c.
12th day, ½ c.c. human ascitic fluid
28th day, 2 c.c. sheep r.b.c.
40th day, ¼ c.c. human serum
1st day, 2 c.c. sheep r.b.c.
5th day, 2 c.c. sheep r.b.c.
16th day, 1 c.c. human serum
29th day, ½ c.c. human serum
1st day, 2 c.c. sheep r.b.c.
5th day, 2 c.c. sheep r.b.c.
16th day, control – no serum
1st day, 2 c.c. sheep r.b.c.
5th day, 2 c.c. sheep r.b.c.
12th day, 2 c.c. ascitic fluid
18th day, 2 c.c. sheep r.b.c.
29th day, ¼ c.c. typhoid vaccine
41st day, 2 c.c. sheep r.b.c.
50th day, 1 c.c. human serum
57th day, 2 c.c. sheep r.b.c.
62 nd day, 2 c.c. sheep r.b.c.
72nd day, ¼ c.c. human serum
0 10 20 0 10 20 30 40 0 10 20 0 10 20 0 10 20 30 40 50 60 70 days

Chart 5 (Series 5.)—Lysins for sheep cells.

The hemolytic system in these experiments consisted of 0.10 c c fresh guinea-pig complement (diluted 1:10), 0.5 c c of a 2% suspension of fresh washed sheep corpuscles, 1.5 c c of 0.9% salt solution, and graduated amounts of inactivated rabbit serum. The least amount of serum that would cause complete hemolysis after incubation at 37 C. for 1 hour was recorded as the lysin titer.

A total of 20 rabbits was used in this series. The rabbits were injected intravenously with 2 initial doses of sheep corpuscles in salt solution. As a rule the lysin content was then measured, 10-12 days after the last injection, it having been determined that the lysin titer normally reaches its height by the end of this period. After foreign protein injections, either human serum or typhoid vaccine, the lysin content was again determined, usually in 72 hours, in order to give ample time for any resulting change in titer to take place.

In Rabbit 386 sheep cells evidently acted as an inferior antigen, the lysin content 11 days after the second injection being very low and remaining so; 0.25 c c of human serum injected on the 17th day after the last injection did not influence the lysin content. Believing that this was due to the fact that the tissue cells were no longer properly sensitized, another injection of sheep cells was given. Eleven days after this the titer was still at the same low level. An injection of foreign protein (typhoid vaccine) was then given, and an immediate marked liberation of lysins occurred. These antibodies disappeared rapidly. A second injection of typhoid vaccine in 7 days had no effect on raising the lysin titer, but the curve continued to fall rapidly. A third injection of red cells was then given and this time acted as a perfect antigen. The lysin content rose to its height in 10 days and remained high for several days. After it began to decrease another injection of red cells was given, but this time an injection of ascitic fluid was given only 4 days later, in order to determine whether an early stimulation by foreign protein would serve to liberate antibodies. A very pronounced mobilization of lysins followed.

This alternating introduction of red cells and foreign protein was continued. Everytime the mere injection of antigen (red cells) failed to produce lysins in the rabbit serum a mobilization of these antibodies could be effected by foreign protein. When, on the other hand, there was a normal response to the antigen, the foreign protein was followed by no further liberation of lysins. After the last 2 injections of red cells apparently all the receptors were not spontaneously liberated because there was a slight response to foreign protein 10 days later.

Rabbits 387 and 362 were of the same type, as they failed to respond to injections of red cells by a proper production of antibodies, but when then injected with foreign protein a marked liberation of lysins occurred.

Rabbits 30 and 39 responded very well to the antigenic stimulation of sheep cells; Rabbit 39 was used as a control while Rabbit 30 received human serum on the 11th day following the last injection of antigen. No marked difference was noted in the reactions of the 2 rabbits. This was observed also in a number of other cases. When the titer is already high, foreign protein will not bring about a further rise in antibody content.

Rabbit 51 represents a negative result which cannot be readily explained. The typhoid vaccine injected on the 29th day should have been followed by a rise in antibodies, according to our other observations, since the red cells 11 days earlier had not produced a liberation of lysins. In other respects, however, this curve is in accord with the general results.

Summary.

In rabbits sensitized with streptococci a definite liberation of specific opsonins and agglutinins follows the injection of foreign protein.

A similar rise in specific opsonins also occurs in rabbits sensitized with meningococci.

Foreign protein injections have no effect on antibodies in typhoid immune rabbits.

In suitable rabbits, which do not readily produce lysins against sheep corpuscles, the injection of foreign protein within 10 days after the injection of antigen is followed by a marked liberation of specific lysins.

A variety of foreign proteins can be used. Human serum, typhoid vaccine, human ascitic fluid, and guinea-pig serum proved equally efficacious.

Conclusion.

The intravenous injection of foreign protein serves as a stimulus for the liberation of specific antibodies in animals in which the previously injected antigen is unable to cause such a liberation. This insufficiency may lie either in the antigen or in the rabbit.

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Editorial Department.

THE AMERICAN LEGION AND ITS SIGNIFICANCE.

The return of the American fighting man is distinctly an all-American event. Homes and offices and factories say, with unmodified universality, "Our boys are returning," our boys in truth, for these are they who a few months since left home and vocation for the defense of civilization. The editor when visiting a great military camp heard another visitor say of the men there, "They seem like well-behaved, decent enough fellows; I am surprised!" Like a flash another visitor replied, "You need not be! These men are our men, picked from our

homes, almost every home. They represent American loyalty, American ideals, American life." Pride in them is the pride of parenthood, of kinship, of national affection.

The American fighting man, to the minds of Americans at least, is separated by a great difference from those of other lands, or, perhaps, it is better to say, was until a recent date. In the brief annals of American military life there have been no pages censored because of dishonorable objectives, no wars of religion, or private greed, of national conquest. When he took his place in history it was under a banner of new design which bore a rare inscription. The continental was a Sir Galahad in quest of the Holy Grail of human liberty. When again he appeared under that sacred emblem it was to preserve intact the land he believed was the hope of mankind, and incident to his struggle gave liberty to 3,000,000 of men. Years later came to him the cry of the oppressed at his door and he bore successful arms against the oppressor.

Then came Armageddon. For a time the great contention seemed to be for self preservation. Belgium was devastated, Northern France was over-run almost to Paris, England felt the nearness of a great danger. The real issues were obscured; so strong was the primal instinct that they were unobserved until they thrust themselves upon the attention of the world. It was seen that the war was not a nationally personal thing but that a principle of civilization was at issue. Democracy had been regarded by Europe as a partially tried experiment and it was sometimes ridiculed then. Autocracy, offspring of times prehistoric, nurtured in the superstition of mediaevalism, entertained by the governments of Europe as a household pet, had declared itself unalterably opposed to the dearest of human rights. Red of tooth and claw it tore to shreds the bonds of civilization; covenants, leagues, honor, righteousness, womanhood, childhood, deity, everything that enlightened peoples prize it prostituted, ravaged, spurned. That was the issue, the fundamental objective of the struggle and so, England is linked with Belgium, joined to France, not in self defense but for the salvation of mankind, the preservation and establishment of democracy.

America, ever the champion of human freedom, at first slow to grasp the moment of the conflict, not sensing the fundamental relation of it to her own institutions, not recognizing that the cause of war was beyond national aims, was international, watched and waited. Gradually thru the smoke of battle, the dismay, the tears the fact stood forth. The war was our war, the principle at stake was the cornerstone of our constitution. Europe so long enamored of her mediaeval legacy had the issue thrust upon her. Every people who prized freedom heard the call and America replied with her sons, the devotion of her daughters, the

consecration of her homes, the full measure of her energy, and the result was Victory.

Now these millions have returned, have returned with visions of things as they had left them waiting to welcome them. But for every man was change and disappointment. The adaptation necessary when he left must be readapted for his return. The great demands of war no longer urgent, the factory and mill and shop and mine must undergo another reorganization. Likewise has the atmosphere changed. The air is vibrant with discontent. The profiteer, that form of traitor whose punishment has never been justly administered is in the limelight. Blunders inexcusable and gross which cost money and lives are bared but not chastised. Politics has been the Judas-like companion of patriotism and is not docketed for trial. Uprisings are seen, open criticisms are heard, stupendous problems press for solution, issues are bitterly debated, economics reek with injustice and this man who returned with joy finds the land he loves as his life, stretching its hands to him in need.

What will he do? When the "continentals in their ragged regimentals" came back from Yorktown that question was asked. The answer was the foundation of this mighty commonwealth which they laid. When the victors returned from Appomattox people said, "What would appeal to men who had spent four years in military service?" The reply is the sixty years of national development between that date and this. Again it has arisen. When some beheld the reverent multitude beside the passing flag and marching column they complained that we were becoming military, that we were worshipping Mars!" Extremists said, "We are doing exactly what Germany has done." To all of this the fighters of our democracy are making reply. Counting the war over when they reached the demobilization camps they ignored military routine and counted officers as no better than themselves—not so good, in fact, if they had not been overseas—and often refused to salute. At his earliest convenience the soldier puts his uniform in his memory chest and counts it his privilege to be a civilian. He hears the din about him and determines his course. He voices his confidence in his nation's destiny and pledges his life and services anew to his home, the constitution. What those who complain do not seem to know he knows, that there is no land like this land, no flag like his flag, no citizenship like his citizenship. His sentiment takes permanent form in the American Legion organized in St. Louis in May in which the spirit of unselfish service was illustrated by unanimously refusing the suggested six months additional pay for discharged soldiers. Any chance of the society being made a political power was considered and made impossible. Radical movements tinged with non-Americanism were severely arraigned and it was

evident from every action taken that the Legion was organized primarily to promote 100% Americanism. Coming years, we believe, will show them worthy of their sires.

To him America is "God's last chance for the human race" worth fighting for, worth dying for, and possibly harder, worth living for. If in the perilous time of reconstruction citizenship is always on trial, America's fighting hosts have declared that they stand sponsors for the highest and best of American ideals, for American homes and institutions and against everything that raises a voice or a hand against them. The American Legion may well be given first place in the line of defense against un-American philosophies and is the best possible agency to defeat them. Every magazine and newspaper should give the organization its fullest support and we know that the dental profession which contributed so loyally to the national cause during the war will give hand and voice to this new and magnificent force organized to "safeguard and transmit to posterity the principles of justice, freedom and democracy."

MOBILIZE FOR PEACE.

The armistice has been signed, but the Red Cross is waging a war that knows no armistice—a war against disease, unhealthy living conditions, starvation—all the lingering poisons of the past.

The Red Cross asks you to hold fast to the ranks; to carry on in the work of restoration; to keep the faith with the widows and orphans of the heroic millions who died on Europe's Calvary that you might live. Are you going to sign an armistice before **this** war is over?

The Red Cross has never been content with temporary makeshift methods of relief—the work must be well done or not at all, and this work of war relief has only just begun. World-wide distress has followed in the wake of this war. The Red Cross needs workers as never before. It needs **your** heart, **your** brain, your **hands**—could you devote them to a better cause?

The Third Red Cross Roll Call will be held November 1st to 11th.

The Goal is Twenty Million Members.

There is need for the immediate services of one million volunteer workers to enroll them.

Are You Ready to Answer the Call?

Then every dentist should sign up for volunteer work at his nearest Red Cross local chapter and

MOBILIZE FOR PEACE.

New Orleans Program
October 20-24, 1919

PROGRAMME

TWENTY-THIRD ANNUAL SESSION OF THE NATIONAL DENTAL ASSOCIATION.

TO BE HELD IN

NEW ORLEANS, LA., OCTOBER 20, 21, 22, 23, 24, 1919.

MONDAY, OCTOBER 20.

Registration.....8:30 A. M.
(Grunewald Hotel, Second Floor.)

Board of Trustees.....9:30 A. M.
(Parlor E, Second Floor, Grunewald Hotel. All subsequent meetings held at same place.)

First Session—House of Delegates.....10:30 A. M.
(Gold Room, Second Floor, Grunewald Hotel.)

MONDAY AFTERNOON.

Second Session—House of Delegates.....2:00 P. M.
(Gold Room, Grunewald Hotel.)

TUESDAY MORNING, OCTOBER 21.

(Atheneum, Grunewald Hotel.)

9:45 A. M.

FIRST GENERAL SESSION.

Invocation.
By the Most Rev. Archbishop Shaw.....New Orleans, La.

Address of Welcome.
By Gov. Pleasant, on behalf of State.....Baton Rouge, La.

Mayor Martin Behrman, on behalf of City.....New Orleans, La.

Response to Address of Welcome.
By J. P. Buckley....Los Angeles, Calif.

President's Address.
By C. Victor Vignes.....New Orleans, La.

Report of the American Academy of Peridontology on "Paraphernalia and Technic Recommended for the Personal Care of the Mouth."
By Jules J. Sarrazin, President.....New Orleans, La.

TUESDAY AFTERNOON.

2:00 P. M.

Prosthetic Dentistry and Crown and Bridge-work.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

OFFICERS OF SECTION.

William A. Giffin, Chairman.....Detroit, Mich.
609-610 Washington Arcade.

Julius F. Hovestadt, Vice-Chairman..Boston, Mass.
200 Marlboro.

K. G. Knoche, Secretary.....Chicago, Ill.
25 E. Washington St.

PROSTHETIC DIVISION.

"A Study of the Temporo-Mandibular Joint with Special Reference to Lateral Movements of the Jaw in Relation to the Occlusion and Articulation of the Teeth."
By J. Leon Williams, New York City.

"Scientific Interpretation of Muscular Control of Mandibular Movements."
By Geo. H. Wilson.....Cleveland, O.

"Surgical Interference in Preparation of Malformed Mouths for Construction of Artificial Dentures."
By James P. Ruyl.....New York City.

"Correction of Mal-occlusion in Artificial Dentures."
By M. M. House.....Indianapolis, Ind.

"Selection of Artificial Teeth for Prosthetic Restorations."
By P. C. Lowery.....Detroit, Mich.

TUESDAY AFTERNOON.

2:00 P. M.

Oral Surgery, Exodontia and Anesthesia.

(Gold Room, Second Floor, Grunewald Hotel.)

OFFICERS OF SECTION.

Arthur E. Smith, Chairman.....Chicago, Ill.
210 South Lincoln St.
Chalmers J. Lyons, Vice-Chairman, Ann Arbor, Mich.
John W. Seybold.....Denver, Colo.
304 Mack Bldg.

Symposium: "Apicoectomy."

"Its Indications and Contraindications and Root-Canal Technic."
(Illustrated with stereoptican slides.)
By Thomas B. Hartzell.....
.....Minneapolis, Minn.

"Surgical Technic of Apicoectomy."
(Illustrated with stereopticon slides.)
By Chalmers J. Lyons.....
.....Ann Arbor, Mich.

Discussed by
Thomas P. Hinman.....Atlanta, Ga.
William L. Shearer.....Omaha, Nebr.
Carl D. Lucas.....Indianapolis, Ind.
Clarence J. Grieves....Baltimore, Md.
H. A. Maves.....Minneapolis, Minn.

"Nitrous Oxid-Oxygen Anesthesia in Oral Surgery and Dentistry."
By J. A. Heidbrink.....
.....Minneapolis, Minn.

Discussed by
Wm. H. Deford.....Des Moines, Iowa.
John W. Seybold.....Denver, Colo.
Boyd S. Gardner.....Rochester, Minn.
C. F. B. Stowell.....Chicago, Ill.

"Tic doloureaux—Etiology—Diagnosis—Treatment—Palliative—Blocking and Surgical."
By Rudolph Matas (M. D.).....
.....New Orleans, La.

Discussed by
Herbert A. Potts.....Chicago, Ill.

TUESDAY AFTERNOON.

2:00 P. M.

Orthodontia and Periodontia.

(Green Room, Twelfth Floor, Grunewald Hotel.)

OFFICERS OF SECTION.

J. Herbert Hood, Chairman.....Cleveland, Ohio.
1101 Guardian Bldg.
Harry E. Kelsey, Vice-Chairman....Baltimore, Md.
833 Park Ave.
J. Opie McCall, Secretary.....Buffalo, N. Y.
437 Franklin.

"An Analysis of the Various Principles of Orthodontic Treatment that have been Advocated during the Last Fifteen Years."
By J. A. Cameron Hoggan.....
..... Richmond, Va.

"Necessity for Oral Prophylaxis and Radiology in the Practice of Orthodontia."
By F. M. Casto.....Cleveland, Ohio.

"Observations upon the More Recent Developments in Periodontology."
By Arthur H. Merritt.....
.....New York, N. Y.

"Why the Field of Prophylaxis is Marked with a Lack of Enthusiasm."
By Dorothea A. Howes.....
.....Washington, D. C.

TUESDAY AFTERNOON.

4:15 P. M.

Third Session—House of Delegates.

(Gold Room, Second Floor, Grunewald Hotel.)

TUESDAY EVENING.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

8:15 P. M.

SECOND GENERAL SESSION.

Program Incomplete.

WEDNESDAY MORNING.

9:00 A. M.

Operative Dentistry, Materia Medica and Therapeutics.

(Green Room, Twelfth Floor, Grunewald Hotel.)

OFFICERS OF SECTION.

J. F. Biddle, Chairman.....Pittsburgh, Pa.
517 Arch St.
H. Herbert Johnson, Vice-Chairman....Macon, Ga.
Commercial Bank Bldg.
Harold S. Smith, Secretary.....Chicago, Ill.
1010 Belmont Ave.

"The Prevention of Chronic Mouth Infection."
(Illustrated with stereopticon slides.)
By Arthur D. Black.....Chicago, Ill.

Abst.—This paper will consider briefly the pathological changes which occur in cases of chronic alveolar abscess and chronic pericementitis, and will then

discuss the causes and take up in detail the methods to be employed in operative dentistry for their prevention. Extensive studies of radiographs of root fillings will be reported, and means of simplifying pulp treatment and root-canal technic will be presented. Particular stress will be laid upon improvements in operative procedures to prevent peridental infection.

Discussed by
H. E. Friesell.....Pittsburgh, Pa.
A. H. Hipple.....Omaha, Neb.

"X-ray in Dental Practice."
By C. Edmund Kells.....
.....New Orleans, La.

Discussed by
H. B. Tileston.....Louisville, Ky.
Howard R. Raper, Albuquerque, N. M.

WEDNESDAY MORNING.

9:00 A. M.

Organization, Mouth Hygiene and Public Service.

(Gold Room, Second Floor, Grunewald Hotel.)

OFFICERS OF SECTION.

C. M. Kennedy, Chairman.....Des Moines, Ia.
605 Citizens Bank Bldg.

Charles H. Oakman, Vice-Chairman..Detroit, Mich.
1241-1247 David Whitney Bldg.

Burton Lee Thorpe, Secretary.....St. Louis, Mo.
415 Metropolitan Bldg.

"Government Recognition of Mouth Hygiene."
By Major H. B. Butler, D. C., U. S. A., Walter Reed Hospital, Washington, D. C.

"Come Clean." (Three-Reel Film Made at the Army Medical Museum, by Direction of Surgeon General's Office).
By Major Leonard G. Mitchell, D. C., U. S. Army, St. Elizabeth Hospital, Washington, D. C.

WEDNESDAY MORNING.

9:00 A. M.

Histology, Physiology, Pathology, Bacteriology and Chemistry—Research.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

OFFICERS OF SECTION.

Weston A. Price, Chairman.....Cleveland, Ohio.
8803 Euclid Ave.

Frank O. Hetrick, Vice-Chairman..Ottawa, Kansas.
324 Main St.

Harris R. C. Wilson, Secretary....Cleveland, Ohio.
701 Schofield Bldg.

"How Mouth Infection Affects the Kidneys."
By Thomas B. Hartzell.....
.....Minneapolis, Minn.

"A Phase of Dental Caries."
By Percy R. Howe.....Boston, Mass.

"A Biochemical Study of Bacterial Metabolism in Its Relation to the Denser Tooth Structures."
By Samuel E. Pond, Cleveland, Ohio.

"A Note on Staining and Mounting Sections of the Dental Tissues."
By Hopewell Smith, Philadelphia, Pa.

WEDNESDAY AFTERNOON.

2:00 P. M.

Prosthetic Dentistry, and Crown and Bridge-work.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

CROWN AND BRIDGE DIVISION.

"Porcelain Jacket Crown Technic."
By A. L. Legro.....Detroit, Mich.

"Cast Clasp Technic in Removable Bridge-work."
By Norman B. Nesbett, Boston, Mass.

"The Gold Shoulder Crown Technic."
By Wm. H. Elliot.....Detroit, Mich.

"Definite Technical Procedure Which Will Minimize Debasement of Precious Metals and Their Alloys When Used In the Construction of Cast Clasps, Lingual Bars, Dowels and Other Appliances Used as Attachments for Prosthetic Restorations."
By L. J. Weinstein....New York City.

"The Range of Occlusion In Construction of Bridge-work."
By Geo. S. Monson.....St. Paul, Minn.

"Fixed Bridge Attachments for Vital Teeth."
By E. F. Tinker....Minneapolis, Minn.

WEDNESDAY AFTERNOON.

2:00 P. M.

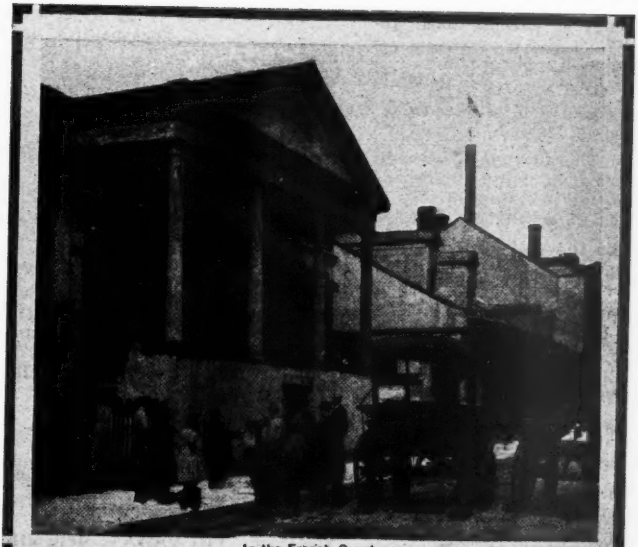
Oral Surgery, Exodontia and Anesthesia.

(Gold Room, Second Floor, Grunewald Hotel.)

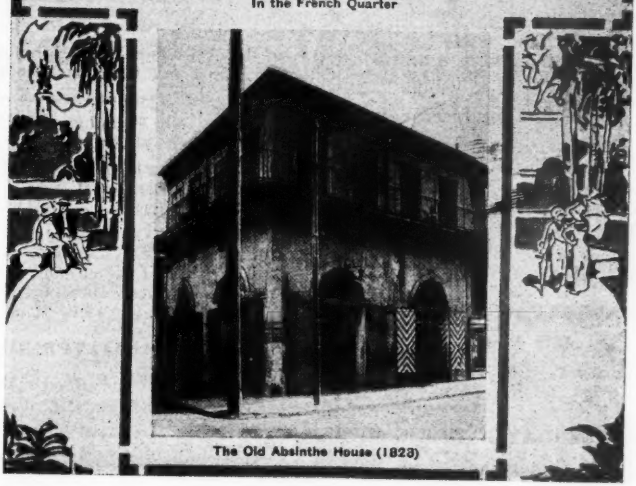
SECOND SESSION.

"Impacted Lower Third Molar." (Illustrated.)
By George B. Winter—St. Louis, Mo.

Discussed by
J. P. Henahan.....Cleveland, O.
Harry W. Allen.....Kansas City Mo.
O. T. Dean.....Seattle, Wash.
Roy S. Hopkinson....Milwaukee, Wis.
Leroy S. Miner.....Boston, Mass.



In the French Quarter



The Old Absinthe House (1823)

Symposium: "Block Anesthesia."

"Preparation of Solution."
By E. A. Litchfield....Humboldt, Nebr.

"Pharmacology of Various Local Anesthetics."
By Samuel L. Silverman.....
.....Atlanta, Ga.

"Indications and Contraindications."
By Fred F. Molt.....Chicago, Ill.

"Suggestive Therapy and Treatment of Abnormal Conditions During and Following Injections."
By P. G. Puterbaugh.....Chicago, Ill.

"Diseases of the Antrum."
(Illustrated with stereopticon slides.)
By Charles H. Oakman, Detroit Mich.

Discussed by
R. Boyd Bogle.....Nashville, Tenn.
Truman W. Brophy.....Chicago, Ill.

WEDNESDAY AFTERNOON.

2:00 P. M.

Orthodontia and Periodontia.

(Green Room, Twelfth Floor, Grunewald Hotel.)

"Plurality in Etiology of Periodontoclasia."
By John O. McCall.....Buffalo, N. Y.

"What to Extract, and What Not to Extract, with Reference to Infections Involving the Periodontal Membrane."
By Louis D. Corriell....Baltimore, Md.

"An Analysis of Case Characteristics with Reference to the Selection of the Most Efficient Form of Appliance for Treatment."
By A. H. Ketcham.....Denver, Colo.

"The Problem of Retention."
By C. A. Hawley....Washington, D. C.

WEDNESDAY AFTERNOON.

4:15 P. M.

Fourth Session—House of Delegates.

(Gold Room, Second Floor, Grunewald Hotel.)

WEDNESDAY EVENING.

8:00 P. M.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

THIRD GENERAL SESSION.

"War Oral Surgery."
By Representatives of the American and English Governments.

THURSDAY MORNING.

9:00 A. M.

Operative Dentistry, Materia Medica and Therapeutics.

(Green Room, Twelfth Floor, Grunewald Hotel.)

"Some Recommendations for the Sterilization and Filling of Infected Roots."
By Weston A. Price.....Cleveland, O.

Discussed by
Clarence J. Grieves.....Baltimore, Md.
Percy R. Howe.....Boston, Mass.

"The Gold Inlay."
By R. H. Volland.....Iowa City, Iowa.

Discussed by
Wallace Wood.....New Orleans, La.
W. L. Fickes.....Pittsburgh, Pa.

THURSDAY MORNING.

9:00 A. M.

Organization, Mouth Hygiene and Public Service.

(Gold Room, Second Floor, Grunewald Hotel.)

Program Incomplete.

THURSDAY MORNING.

9:00 A. M.

Histology, Physiology, Pathology, Bacteriology and Chemistry-Research.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

"A Dental Histo-Pathological Study."
By Harold Box.....Toronto, Canada.

"Physiology and Pathology of Special Interest to Dentists."
By J. J. Sarrazin....New Orleans, La.

"Studies of the Variations in Susceptibility to the (so-called) Rheumatic Group Lesions and to the Influence of Oral Focal Infections."
By Weston A. Price.....Cleveland, O.

THURSDAY AFTERNOON.

2:00 P. M.

(Gymnasium, New Elks' Home.)

General Clinic.....2:00 to 5:00 P. M.

(See Clinic Program on Page 850.)

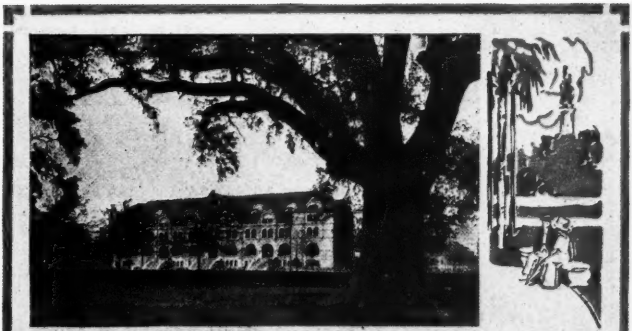
THURSDAY EVENING.

8:15 P. M.

(Convention Hall, Twelfth Floor, Grunewald Hotel.)

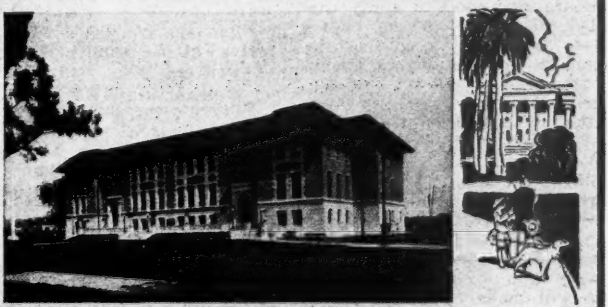
FOURTH GENERAL SESSION.

Educational Program.



Gibson Hall, Tulane University

Loyola University



Beauregard Public School

FRIDAY MORNING.

9:00 A. M.

(Gymnasium, New Elks' Home.)

General Clinic.....9:00 to 12:00 A. M.

FRIDAY NOON.

12:00 M.

House of Delegates. (This last roll call will be the "Permanent and Official Roll Call" of the 1919 Meeting.)

LAST GENERAL SESSION.

(Installation of Officers, etc.)

THE GENERAL CLINICS.

TWO HALF DAYS.

Thursday Afternoon, October 23, 2 P. M.

Friday Morning, October 24, 9 A. M.

IN THE GYMNASIUM—NEW ELKS' HOME.

S. H. McAfee, Chairman,
1225 Maison Blanche Bldg.,
New Orleans, La.

E. B. Ducasse
Wm. J. Healey
H. J. Feltus

Fred Ratzburg
M. B. Varnado

The General Clinics will be held in the gymnasium of the new Elks' Home. They will consist principally of table clinics. Space for as many as can see and hear will be provided for each clinic.

A placard indicating the number of the clinic will be suspended over each table, easily seen from any point in the auditorium. These numbers will correspond to numbers in the printed program which will give titles of clinics, names of clinicians, etc.

Members are requested to study this program beforehand, select the clinics they wish to see, make a note of the numbers, and on entering the auditorium familiarize themselves with the location of these numbers.

Half of the clinics will be given in full at the first session of clinics (Thursday Afternoon) and half at the second session, (Friday Morning.) For example: If there are ten different clinics on Denture Construction, five of them will be given at the first session and five at the second session. The idea being to give some of every type of clinic at each session. This will make it practicable for the clinicians themselves to see some of the clinics. It will give those attending the opportunity of seeing twice as many clinics.

This year the clinics will all begin at a given signal, run thirty minutes, and finish at a given signal. A few minutes intermission will be allowed for rest, and for the audience to 'progress' individually, at pleasure. At the signal all clinics will begin (from the beginning) and repeat. It is believed that this arrangement will avoid in a measure the confusion of the continually floating audience. The audience will at least know when the clinics are starting and stopping.

The audience is requested to move promptly at the signals, to not interrupt clinicians during the clinics, and to refrain from unnecessary conversation and noise.

Clinicians are requested to report upon arrival at the Clinic Hall to the Clinic Committee, who will have sufficient assistants to afford Clinicians every facility for carrying on their work.

Clinicians are expected, as far as possible, to furnish all necessary instruments and equipment.

The Clinics will commence at 2 P. M. and 9 A. M. sharp. All Clinicians are expected to be at their tables on time.

Tables for the Unit Clinics will be arranged so that the largest possible number will be able to witness the Clinics in the order in which they are arranged.

No one will be allowed to sell any instrument, materials or appliances in the Clinic Hall.

1.

James Kendall Burgess....New York City.
"A Direct Method of Bridge-work Based on the Indirect Methods of Attachment Construction."

View in Up-town Residence Section

Another Residential View

2.
Arthur B. Crane.....Washington, D. C.
"Culture Methods in Root Canal Work."

3
E. P. Beadles.....Norfolk, Va.
"Pyorrhea."

4.
J. F. Biddle.....Pittsburgh, Pa.
(Subject Later.)

5.
A. P. Lee.....Philadelphia, Pa.
(Subject Later.)

6.
Victor Hugo Jackson.....New York City.
"The Plan and Efficiency of the Jackson System of Orthodontia."

7.
C. M. Ballenger.....Lubbock, Texas.
"A Correct Method of Mounting Models in Articulator in Bridgework."

8.
W. A. Coston.....Topeka, Kans.
"Demonstrating Technic of Making Shoulder Crown."

9.
C. L. Alexander.....Charlotte, N. C.
"Subject to be announced later."

10.
Thos. M. Terry.....New Orleans, La.
(Subject Later.)

11.
Wm. John Healey.....New Orleans, La.
"A Form of Fixed Sanitary Bridge upon Vital Teeth."

12.
F. H. Waters.....Ames, Iowa.
"A Technic in Making Wax-Pattern for Gold Inlays."

13.
E. A. Smith.....New York City.
(Subject Later.)

14.
E. G. Link.....Rochester, N. Y.
(Subject Later.)

15.
R. H. Volland.....Iowa, City, Iowa.
"A Simplified Method of Casting Gold Inlays."

16.
Ralph Fouser.....Salem, N. D.
"Preparation of the Solution for Nerve Blocking."

17.
M. M. House.....Indianapolis, Ind.
"Correction of Mal-Occlusion in Artificial Dentures."

18.
Leonidas F. Smith.....Indianapolis, Ind.
"The Only Correct Principles upon which to Construct Full Upper and Lower Dentures, Showing the Simplicity of the Method."

19.
Karl W. Knapp.....Des Moines, Iowa.
"Special Inlay Technic."

20.
Nye W. Goodman.....Los Angeles, Cal.
"Porcelain Jacket Crown Technic."

21.
Chas. G. Hartley.....Los Angeles, Cal.
"Porcelain Jacket Crown Technic."

22.
B. B. McCollum.....Los Angeles, Cal.
"Inlay Technic."

23.
Albert W. Marshall.....San Antonia, Tex.
"Bridge Abutments: Conserving Pulps."

24.
Herbert F. Stevens.....Aberdeen, S. D.
"Making Current Literature a Quick Reference Library."

25.
C. A. Martin.....Winfield, Kans.
"Little Conveniences."

26.
Ned A. Stanley.....New Bedford, Mass.
"Treatment of Pyorrhea by Instrumentation."

27.
George T. Baker.....Boston, Mass.
"Orthodontia."

28.
W. Clyde McClelland....Kansas City, Mo.
"A Technic for Constructing Continuous Gum Dentures."

29.
Geo. B. Clement.....Meridian, Miss.
"The Use of the Electric Cautery in the Treatment of Pyorrhea, Using Split Electrodes."

30.
J. T. Kernan.....Wichita, Kans.
"Use and Construction of Partial Cast Crowns."

31.
E. C. Glass.....Independence, Kans.
"Crowns, Fillings and Inlays with Tooth Forms."

32.
R. P. Thomas.....Louisville, Ky.
"Synthetic Veneers."

33.
Rupert E. Hall.....Chicago, Ill.
Assisted by E. E. Bailey, Denver, Col.
"Artificial Dentures."

34.

P. C. Lowery.....Detroit, Mich.
"Esthetic Selection and Arrangement of Artificial Teeth."

35.

E. T. Tinker.....Minneapolis, Minn.
"Bridge Abutments for Vital Teeth and Porcelain Tipped Dummies."

36.

Jas. P. Ruyl.....New York City.
"Surgical Treatment of Abnormal Mouths Before Putting in Artificial Dentures."

37.

Frank M. Wadsworth..Minneapolis, Minn.
"Partial Denture Articulation and Selection of Harmonious Tooth Forms."

38.

F. H. Skinner.....Chicago, Ill.
"A Pin Inlay Bridge, Eliminating in a Measure, the Probability of One End Loosening or of a Tooth Splitting."

39.

R. R. Blanchard.....Springfield, Ill.
"Impressions and Casts for Full Dentures."

40.

C. A. Eller.....Albuquerque, N. M.
(Subject Later.)

41.

A. L. LeGro.....Detroit, Mich.
"Porcelain Jacket Crown Technic."

42.

Wm. H. Elliott.....Detroit, Mich.
"The Gold Shoulder Crown Technic."

43.

Percy R. Howe.....Boston, Mass.
"The Complete Sterilization and Blocking of Diseased Dentin and of Pulpless Roots by Silver Nitrate Reduction."

44.

Elmer S. Best.....Minneapolis, Minn.
"Standardized Oral Examination for the Isolation of Decisive Factors, Determining Conservation or Loss of Non-Vital Teeth."

45.

Chas. A. Spahn..... N. J.
"A New Technic for Clasp Construction and its Application to Orthodontia."

46.

W. F. Barry.....N. J.
"Mechanically Anchored Abutments in Bone for the Support of Artificial Reconstructions."

47.

Abram Hoffman.....Buffalo, N. Y.
"Orthodontia—The Lingual Arch as Suggested by Dr. J. B. Mershon and Modifications."

48.

Hugh Avary.....San Francisco, Cal.
"The Esthetic Restoration of Tooth Form with Porcelain Jacket Crowns."

49.

Dr. A. W. Ward.....San Francisco, Cal.
"Advanced Prophylaxis."

50.

C. A. Hawley.....Washington, D. C.
"Removable Retention."

51.

S. E. Brice.....Lewiston, Mont.
"Demonstrating the Impossibility of Properly Filling Root Canals."

52.

Daniel H. McCauley.....Laurel, Montana.
"Ununited and Infected Maxillar and Mandible Fractures due to Gunshot Wounds."

53.

John B. LaDue.....Mattoon, Ill.
"Bite Taking for Full Upper and Lower Dentures."

54.

M. T. Moran.....Deming, N. M.
"Easy Cleansing Bridge Dummies by an Economical Method."

55.

Dayton Dunbar Campbell.....
.....Kansas City, Mo.
"A Practical Demonstration of the Esthetic Possibilities of Continuous Gum Dentures."

56.

Ewing P. Brady.....St. Louis, Mo.
"A Comparison of Root Filling Materials."

57.

Chas. A. Furrow.....Tulsa, Okla.
"Modern Technic of the Various Forms of the Roach Attachments."

58.

Wm. H. and J. R. DeFord.....
.....Des Moines, Iowa.
"The Unimpacted Lower Third Molar."

59.

E. A. Litchfield.....Humboldt, Nebr.
"Scientific Preparation of the Vehicle and the Injecting Solutions for Nerve Blocking."

60.

Arthur E. Smith.....Chicago, Ill.
"Block Anesthesia Technic for Oral Surgery and Dentistry, by the Use of Dissected Wet Anatomical Specimens, Charts, Diagrams and Skulls. New Technic will be Shown for Blocking the Gasserian Ganglion; Second Division of the 5th Nerve; Intra-Osseous Anesthesia, also Deep Nerve Block for Tonsillectomy and Antrum Cases."

61.

Ira G. Nichols.....Mandan, N. D.
"Nerve Blocking. Demonstrating the Effects of the Hypotonic; Isotonic and Hypertonic Solutions Upon the Blood and Tissue Cells."

62.

F. Ewing Roach and G. W. Dittmar.....Chicago, Ill.
Joint Clinic: "Clasps and Attachments for Retaining Partial Artificial Removable Dentures, also Showing a Technic for Accurate Cast Clasp Construction."

63.

Howard T. Stewart.....New York City.
"Removable Bridge-work."

UNIT CLINICS.

THE WISCONSIN DENTURE UNIT.

Seven tables, Demonstrating Various Procedures in Modern Denture Construction.

Geo. P. Brenner, Chairman.

64-70.

Table 1—A. A. Jennings and C. J. Jane, Milwaukee.

Table 2—Geo. P. Brenner, C. E. Gage, P. G. Hirtz, Milwaukee.

Table 3—W. F. Faust and J. W. Lewis, Milwaukee.

Table 4—D. E. Ihde and Theo. Kuechle, Milwaukee.

Table 5—E. R. Lamp and V. A. Smith, Milwaukee.

Table 6—A. J. Richter and J. J. Ruhland, Milwaukee.

Table 7—C. W. Hall, P. W. Rood, O. A. Droegkamp, Milwaukee.

THE WISCONSIN GOLD INLAY UNIT.

H. G. Morton, Chairman.

Four Tables Demonstrating Various Procedures from Cavity Preparation to Casting.

71-74.

Table 1—J. G. Schottler and N. E. Uelman, Milwaukee.

Table 2—W. H. Schaller and H. P. Jahn, Milwaukee.

Table 3—F. W. Heinemann and T. L. Gilbertson, Milwaukee.

Table 4—C. M. Schwendener and H. G. Morton, Milwaukee.

75-77.

THE DES MOINES TOOTH-BRUSH CLINIC. UNIT CLINIC.

C. M. Kennedy.....
W. J. Cameron.....Des Moines, Iowa.
W. J. Charters.....

LIST OF EXHIBITORS.

American Surgical Specialty Co., 6 E. Lake St., Chicago, Ill.

Adams X-Ray Co., 1737-45 Woodward Ave., Detroit, Mich.

The American Cabinet Co., Two Rivers, Wis.

Claudius Ash Sons & Co., 1 and 3 Union Square, New York, N. Y.

Julius Aderer, Inc., 47 W. 42nd St., New York, N. Y.

Borine Mfg. Co., 551 W. 42nd St., New York, N. Y.

Frank S. Betz., Hammond, Ind.

Harry J. Bosworth Co., Tower Bldg., Chicago, Ill.

L. D. Caulk Co., Milford, Del.

A. C. Clark & Co., 76th St. and Greenwood Ave., Grand Crossing, Chicago, Ill.

The Cleveland Dental Mfg. Co., Cleveland, Ohio.

The Colgate Company,
P. N. Condit,

Columbia X-ray & Electric Corp., 131 E. 23rd St., New York City.

The Columbus Dental Mfg. Co., Wager & Jackson Sts., Columbus, Ohio.

Consolidated Dental Mfg. Co., 187-189-191 W. Fourth St., New York, N. Y.

Dental Products Co., 5 S. Wabash Ave., Chicago, Ill.

Dental Mfg. Co., Candler Bldg., New York.

The Dentists's Supply Co., 220 W. 42nd St., New York, N. Y.

The Denver Chemical Co., 57 Laight St., New York, N. Y.

Detroit Dental Mfg. Co., 20-22 Milwaukee Ave., W. Detroit, Mich.
A P. de Sanno & Son, 1252 N. Broad St., Philadelphia, Pa.
Edwards X-Ray Mfg. Co., 10th & Fort Wayne Ave., Indianapolis, Indiana.
Electro Dental Mfg. Co., 1224 Cherry St., Philadelphia, Pa.
Fellows Medical Mfg. Co. Inc., 26 Christopher St., N. Y. City.
H. G. Fischer & Co., 2341-2343 Wabansia Ave., Chicago, Ill.
Friedman Bros., 22 E. Washington St., Chicago, Ill.
Goldsmith Bros., Smelting & Refining Co., Heyworth Bldg., Chicago, Ill.
The Halverson Co., 180 N. Dearborn St., Chicago, Ill.
The Harvard Co., 25 E. Washington St., Chicago, Ill.
The Heidbrink Co., 525 S. Fourth St., Minneapolis, Minn.
John Hood Co., 178 Tremont St., Boston, Mass.
Horlick's Malted Milk Co., Racine, Wis.
International Radio Telegraph Co.,
J. W. Ivory, 21 N. 13th St., Philadelphia, Pa.
J. F. Jelenko, 1 Union Square, New York City.
Johnson & Lund, Philadelphia, Pa.
H. D. Justi & Son, 1301 Arch St., Philadelphia, Pa.
Katz & Besthoff, 732 Canal St., New Orleans, La.
King's Specialty Co., Fort Wayne, Ind.
Kolynos Co., New Haven, Conn.
Kress & Owen Co., 361-363 Pearl St., New York, N. Y.
Lavoris Chemical Co., Minneapolis, Minn.
Manhattan Coat Factory, 3223 N. Halsted St., Chicago, Ill.
H. A. Metz, Laboratories, 122 Hudson St., New York, N. Y.
McIntosh Battery & Optical Co., 217-223 N. Desplains St., Chicago, Ill.
Morgan-Hastings Co., 817 Filbert St., Philadelphia, Pa.
The Mynol Chemical Co., Real Estate Trust Bldg., Philadelphia, Penn.
J. M. Ney, Hartford, Conn.
Novocol Chemical Co., 485 Glenmore Ave., Brooklyn, N. Y.
Parke, Davis & Co., Detroit, Mich.
The Pelton & Crane Co., 244 & 256 Harper Ave., Detroit, Mich.
The Pepsodent Co., 1104 S. Wabash Ave., Chicago, Ill.
The Chas. H. Phillips Chemical Co., 128 Pearl St., New York, N. Y.
Ransom & Randolph Co., Toledo, Ohio.
The Ritter Dental Mfg. Co., Rochester, N. Y.
Safety Anaesthesia Apparatus, 142 Bryan Place, Chicago, Ill.
Santiseptic Mfg. Co., Bay St., New Brighton, N. Y.
The W. M. Sharp Mfg. Co., 229 Water St., Binghampton, N. Y.
Stempel Dental Specialty Co., Fort Madison, Iowa.
Lee S. Smith & Son Mfg. Co., Pittsburgh, Pa.
I. Stern Dental Supply Co., 1 and 3 Union Square, West New York, N. Y.
Stratford-Cookson Co., 42 & Ludlow Sts., Philadelphia, Pa.
Thompson Plasterer Co., Leesburg, Va.
Toledo Technical Appliance Co., 2233 Ashland Ave., Toledo, O.
Waite & Bartlett Mfg. Co., 1252 E. 29th St., New York City.
The S. S. White Dental Mfg. Co. Chestnut St., corner Twelfth, Philadelphia, Pa.
Wicomb Dentifrice Co.,
H. B. Wiggin's Sons Co., 160 W. Jackson Blvd., Chicago, Ill.
Wilmot-Castle Co., 800 St. Paul St., Rochester, N. Y.

SPEND YOUR VACATION IN NEW ORLEANS IN OCTOBER.

Members of the National Dental Association fond of fishing had better bring their strongest rods and reels to New Orleans when they come to the national convention, October 20th-24th. The waters surrounding New Orleans are teeming with edible fish from the aristocratic and palatable pompano and mackeral to the plebian and coarser textured catfish and chopique.

"Spend your vacation in New Orleans in October," is a slogan the general convention committee has adopted in urging members to be here for the big meeting. It is understood many will follow this plan. The Indianapolis delegation, coming nearly 100 strong, have announced they intend to fish and enjoy life generally. This does not mean they will pass up the convention; they intend to take to the great outdoors after the meeting is adjourned.

October is an ideal fishing month around New Orleans. The city is surrounded by lakes, bayous, passes, and other forms of water easily reached by railroad. All of the fishing resorts boast clubs at which fishermen can obtain live bait, tackle, food, motor launches and other things that go with a day on the water.

Steps have been taken by the State Conservation Commission to preserve fishing for the whole state; this does not mean that fishing is restricted. These rules apply principally to commercial fishing, the sportsman having ample leeway to catch as many as he likes.

ALL KINDS OF FISH WAITING FOR YOU.

In addition to the speckled trout, red fish, buffalo, drum, croakers and sheephead, the waters abound in sharks and tarpon, the latter measuring all the way from 2 to 6 feet and weighing from 10 to 200 pounds. The tarpon feed on mullet, laying in wait two feet under the surface until a school appears overhead. The tarpon then jumps and splashes, killing mullet right and left. This provides his feast.

As all fishermen know, the tarpon is a fighter, and many are the memorable battles that have been staged in Louisiana waters. The guide of the Winchester Club at Lake Catherine, only a few miles from the City, has for a trophy a tarpon measuring 6½ feet. He landed the monster in twenty minutes with ordinary reel and rod.

When it comes to fish stories, nearly every sportsman in New Orleans can spin them. For instance, Doctor Joseph P. Wahl, general chairman of the local committee, recently visited Mississippi Sound, where he caught five red fish averaging five pounds, in about five minutes.

"They were grabbing the hook before it hit the bottom," he declared.

Not to be outdone, another member of the committee told how he caught a number of 15 pound drums off Deere Island, a famous government game preserve.

One of the favorite methods of fishing is to "bait the hole" the night before. Clams usually are used for this, the bait attracting sheepheads. One fisherman who recently visited Chef Menteur baited a hole the night before and went out early next morning. He caught 30 sheepheads weighing all the way from one to five pounds.

Among the famous fishing holes within a few minutes ride of the city are Lake Pontchartrain, the Rigolets, Lake Catherine, Little Woods, Chef Menteur, South Point, Biloxi, Pass Christian, Bay St. Louis, Ycloskey, Mandeville, Milneburg, Spanish Fort, West End, Lake Borgne and other places too numerous to mention.

NEW ORLEANS, LARGEST SEA FOOD MARKET IN WORLD.

New Orleans, the largest sea food market in the world, also is famous for its oysters. It has been said (by visitors) that the oysters sold in New Orleans have a much richer flavor than the famous Chesapeake Bay product. However, this is a point for discussion among oyster consumers.

Soft shell crabs, frogs, shrimp, clams and hard shell crabs are plentiful in New Orleans and occupy a prominent place on all menus. Those who like sea food will make no mistake by coming to New Orleans whether they are able to go out and catch it or not.

"They'll be bitin' boys; come along," is the word the local committee sends out.

LEADING NEW ORLEANS HOTELS AND THEIR RATES.

Grunewald Hotel—University Place, off Canal street. 500 rooms. Single room without bath for one person, $1.50 per day; for two, $2.50, and up. Single room with bath for one person, $3.00 per day; for two, $4.00, and up. Double room

A Morning's Hunt

Green Trout (Large-Mouth Bass)

without bath, for one person, $2.00 per day; for two, $3.00, and up. Double room with bath, for one person, $4.00 per day; for two, $5.00, and up

St. Charles Hotel—St. Charles and Common Streets. 500 rooms. Rooms occupied by one person, without bath, $2.00 to $3.50. Rooms occupied by one person, with bath, $3.00 to $7.00. Rooms occupied by two persons without bath, $4.00 to $6.00. Rooms occupied by two persons, with bath, $5.00 to $10.00. Parlor, bedroom and bath, $10.00 to $25.00.

Hotel Monteleone—Royal at Iberville street. 400 rooms. Single room without bath for one person, $1.50 per day and up. Single room with bath for one person, $2.50 per day and up. Double room without bath for two persons, $2.50 per day and up. Double room with bath for two persons, $3.50 per day and up.

Hotel De Soto—Baronne at Perdido street. 300 rooms. Single rooms without bath, $1.50 per day and up. Double rooms without bath, $2.50 per day and up. Single rooms with bath, $2.50 per day and up. Double rooms with bath, $3.50 per day and up.

Cosmopolitan Hotel—120 Bourbon St. 100 rooms. Single rooms without bath for one person, $1.00 per day and up. Single rooms with bath for one person, $2.00 per day and up. Double rooms without bath for two persons, $2.00 per day and up. Double rooms with bath for two persons, $3.00 per day and up.

Lafayette Hotel—St. Charles and Lafayette streets. 80 rooms. Single room without bath for one person, $1.50 per day and up. Single room without bath for two persons, $2.50 per day and up. Single room with bath for one person $2.00 per day and up. Single room with bath for two persons $3.00 per day and up. Double room with bath (twin beds) $5.00 per day and up.

Planters Hotel—Dauphine and Iberville Streets. 75 rooms. Single room without bath for one person $1.00 per day and up. Single room with bath for one person $2.00 per day and up. Double room without bath for two persons, $2.00 per day and up. Double room with bath for two persons, $3.50 per day and up.

SCHEDULE OF TRAINS AND RATES TO NEW ORLEANS.

It is not the policy of the United States Railroad Administration to grant special rates for conventions, and as a consequence we will have no special rates for this meeting, but it has been practically decided that Winter Tourist rates will be placed on sale October 1st, 1919, bearing limit of May 31st, 1920, from the same territory and at the same rates that were effective last season (90% of full fare). Complete information can soon be obtained from your consolidated ticket office or local agent.

Seeing the many advantages of bringing our members together at the most available points thus enabling them to travel together the greatest possible distance it has been decided to use the Panama Limited of the Illinois Central, Chicago to New Orleans, on schedule as follows:

Leave	
Chicago (October 18)	12:30 Noon
Kankakee	1:57 P. M.
Champaign	3:28 P. M.
Mattoon	4:23 P. M.
Effingham	4:58 P. M.
Centralia	6:11 P. M.
Carbondale	7:30 P. M.
Cairo	8:33 P. M.
Memphis	1:10 A. M.
Grenada	3:35 A. M.
Canton	5:58 A. M.
Jackson	6:45 A. M.
Hammond	9:45 A. M.
Arrive Sunday, Oct 19th.	
New Orleans	11:15 A. M.

Members from Boston, New York, Philadelphia and intermediate points will find desirable train service on the several lines enabling them to make connection with the above at Chicago. The same is true for members from the ex-

GRUNEWALD HOTEL.—CONVENTION HEADQUARTERS.

treme Northwestern and Northern California territory thru Denver, St. Paul and Minneapolis. Members from Indianapolis, Louisville and contiguous territory can also avail themselves by connections at various points.

Buy tickets of your local agent and specify the National Dental Association train for your reservations.

Fare From Chicago to New Orleans.

Fare from Chicago to New Orleans, including war tax	$30.35
Lower berth, Chicago to New Orleans, including war tax	5.94
Upper berth, Chicago to New Orleans, including war tax	4.75
Drawing room, Chicago to New Orleans, including war tax	21.60
Compartment, Chicago to New Orleans, including war tax	16.74

Trip to Havana—Expenses.

Many inquiries have been received regarding the expense of a trip to Havana, and for the benefit of those interested your Committee has compiled the following data:

New Orleans to Havana, one-way, including berth, meals and war tax	$41.00
New Orleans to Havana, round-trip (Special rate) including berth, meals and war tax	73.40
New Orleans to Havana, thence to New York, including berth, meals and war tax	84.20
Or returning via Key West—Havana to Key West	16.00
Key West to Chicago, via Jacksonville	53.18

Sailing from New Orleans Saturday, October 25th, 48 hours to Havana, Complete round trip one week.

Sailings from Havana to Key West, daily except Thursday and Sunday. Daylight trip, 11 A. M. to 7 P. M.

Also in this connection will advise that passports and deposits covering reservations are necessary. In addition passengers will be required to carry with them certificates showing full payment of 1917 and 1918 income taxes or exemption therefrom. These may be obtained from the local Collector of Internal Revnue. For further information address F. S. Bishop, C. P. A., 112 West Adams St., Chicago, Ill.

D. C. BACON, Chairman,
Transportation Committee N. D. A.,
31 N. State St., Chicago, Ill.

NATIONAL DENTAL ASSOCIATION TWENTY-THIRD ANNUAL MEETING, NEW ORLEANS, OCTOBER 20-24, 1919.

OFFICIAL CALL.

To the Officers and Members of the National Dental Association:

The twenty-third annual meeting of the National Dental Association will be held at New Orleans, October 20-24, 1919.

The House of Delegates will convene at 10:30 A. M., Monday, October 20, in the Gold Room, Grunewald Hotel.

In the House the representation of the various constituent societies for 1919 is as follows:*

Alabama	271
Alaska	0
Arizona	19
Arkansas	164
Army Dental Corps	350

*This roll will be officially revised September 19, 1919.

California State	802
Colorado	223
Connecticut	388
Delaware	0
District of Columbia	122
Florida	179
Georgia	268
Hawaiian Islands	21
Idaho	6
Illinois	2344
Indiana	1046
Iowa	889
Kansas	404
Kentucky	338
Louisiana	137
Maine	112
Maryland	199
Massachusetts	1027
Michigan	923
Minnesota	879
Mississippi	159
Missouri	1067
Montana	144
National Capital	41
Navy Dental Corps	51
Nebraska	421
Nevada	0
New Hampshire	15
New Jersey	604
New Mexico	67
New York	1783
North Carolina	146
North Dakota	296
Ohio	1310
Oklahoma	319
Oregon	277
Pennsylvania	1441
Philippine Islands	1
Porto Rico	0
Rhode Island	122
Southern California	442
South Carolina	261
South Dakota	206
Tennessee	124
Texas	545
**Trustees	
Utah	133
Vermont	60
Virginia	209
Washington	564
West Virginia	221
Wisconsin	741
Wyoming	34

The scientific sections of the National Dental Association, the Dental Corps of the Army, the Dental Corps of the Navy, are entitled to one delegate each.

The general meeting, which constitutes the opening exercises of the Association, will be held at 9:45 A. M. Tuesday, October 21. The various sections of the National Dental Association will meet Tuesday, October 21, at 2:00 P. M., and subsequently, according to their respective programs.

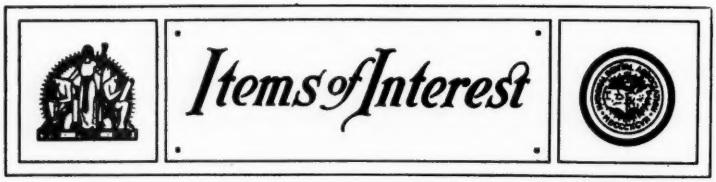
The Registration Department will be open from 8:30 A. M. until 5 P. M. on Monday, Tuesday, Wednesday and Thursday, October 20-21-22-23, and from 8:30 A. M. to 10 A. M. on Friday, October 24.

The Registration Office will be in Parlor E, second floor, Grunewald Hotel.

C. Victor Vignes,
President.

Otto U. King,
General Secretary.

**"Trustees shall be members of the House of Delegates, without the right to vote."—Constitution and By-Laws, Article V, Section 1.



AMERICAN LEGION ACTIVITIES.

In the first three months since the St. Louis caucus of the American Legion, the national organization of American veterans of the Great War, more than 2,400 local posts of former soldiers, sailors, and marines have been formed in the United States. Of this number 1,200 posts have been chartered by the national headquarters of the legion at 19 W. 44th Street, New York City. Application for national charters for 1,239 others are pending, and charters will be issued as rapidly as possible. These local organizations include ex-service men in every state in the Union. Based on the record of charters issued at national headquarters and on reports from state branches, it is estimated that the membership in the American Legion up to July 31 was more than 300,000.

In addition to the formation of local posts, two of the fundamental steps in the organization program of the national executive committee representing the Paris and St. Louis caucuses have been accomplished—the establishment of a nation-wide organization with a governing body at national headquarters and the creation of an active state branch in every state. By September 1 the legion plans to have at least one local post of ex-service men in each congressional district or county in the United States.

During September a membership drive will be conducted in each state under the direction of the state organization. The aim of the organization committee at national headquarters will be to enroll 1,000,000 former soldiers, sailors, and marines prior to the national convention of the legion at Minneapolis on November 10, 11 and 12, when the permanent organization of the legion will be effected. November 11 will be American Legion Day thruout the country. Following the membership campaign in September state conventions will be held in October to elect delegates to the national convention.

Altho the principal effort of the national executive committee of the legion and the state branches prior to the November convention will be directed to organization, active bureaus have been established at national headquarters to render direct service to discharged soldiers, sailors, and marines.

A national reemployment bureau operating thru state branches and local posts in cooperation with Colonel Arthur Woods, assistant to the secretary of war on reemployment, is helping to stimulate public works enterprises to afford employment to discharged veterans.

A national bureau operating thru state branches and local posts also has been established to furnish expert legal advice to discharged men in matters of federal finance, such as a war-risk insurance, allotments, liberty bonds, service pay, bonus, and mileage.

A national speakers' bureau has been

organized under the direction of which Theodore Roosevelt, of New York; John W. Inzer, of Alabama, and J. F. J. Herbert, of Massachusetts, and other spokesmen of the legion will make speaking tours in various parts of the country to present the organization, the aims, and the spirit of the legion to the country.—*Army and Navy Register, August 16.*

NOMINATION OF GENERAL NOBLE.

The nomination of General Robert E. Noble to be assistant surgeon general, with the rank of brigadier general, in the Regular Army, remains to be confirmed by the Senate. All other Army nominations, including that of Colonel W. D. McCaw, to be assistant surgeon general, with the rank of brigadier general, have been confirmed. The nominations of McCaw and Noble were sent to the Senate by the President on June 23. The Senate military committee acted favorably on the former nomination, but rejected the latter by a vote of 7 to 3. Upon a reconsideration of this action on July 24 the Noble nomination was agreed to by a vote of 9 to 7. There has been no objection to the McCaw nomination at any time, but the fact that it was linked up with the Noble nomination interfered with confirmation. The opponents of the latter insist that a full Senate must be present in executive session when the matter is finally disposed of and it is intended that the objections raised in committee shall be aired in the Senate. It is asserted by senators opposed to the Noble nomination that he was promoted over the heads of many officers equally qualified for advancement and against the recommendations of the surgeon general of the Army, and the expressed preference of officers of the medical corps. The surgeon general recommended the appointment of Colonel McCaw and Colonel J. D. Glennon, who is in command of the Walter Reed General Hospital. It also appeared that these names did not represent General Ireland's personal choice alone, who, at the last session of Congress, recommended Colonels J. R. Kean and McCaw, but were the unanimous selection of thirty officers of the Army medical corps on duty in Washington who were assembled to express their views as to their associates who should be recommended for the positions. In both instances the recommendations of the surgeon general in regard to Colonel Kean and Colonel Glennon have been ignored.—*Army and Navy Register, Aug. 2.*

ARMY MEDICAL DEPARTMENT ORGANIZATION.

A division of coordination, organization and equipment has been created in the office of the surgeon general with Colonel Alexander N. Stark, M. C., as chief, and Colonel Arnold D. Tuttle, M. C., and Lieutenant Colonel A. P. Clark, M. C., as assistants.

This organization will study medical department organization, function and equipment requirements, with a view to recommending improvements. It will maintain liaison with the corresponding divisions of other bureaus, such as quartermaster and motor transport corps, with a view to standardization, equipment, transportation and activities in general. It will also revise, produce and maintain up to date all medical department service manuals, prepare organization charts and graphics of medical department activities for peace and war, prepare and maintain tables of organization affecting the medical department, study the provisions of all general orders, circulars, etc., involving medical department policy prior to publication and perform such other functions as from time to time may be designated by the surgeon general.—*Army and Navy Register, August 23.*

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Col. Rex. H. Rhoades, to Fort Slocum, N. Y., for duty.

Lieut. Col. Arthur J. Skillman, report by wire to commanding general, Southern Department, for duty.

Maj. Gerald S. Byrne report in Western Department for duty.

Maj. Leigh C. Fairbank to Denver, Colo., general hospital 21, for duty.

Capt. Alonzo Gooch McCue, jr., to Camp Lee, Va., for duty.

Capt. George Julian Sibley to Washington for duty in office of attending surgeon.

Capt. George J. Krakou to Camp Deming, Ga., for duty.

Capt. William R. Akeroyd report by wire to Southern department for assignment.

Capt. James Gardner Steiner to Camp Lee, Va., for duty.

Capt. Oliver James Christiansen to Camp Funston, Kans., for duty.

Capt. Charles L. Andrews, to Fort Douglas, Utah, for duty.

Capt. Leland Stewart Wilson to San Diego, Calif., Rockwell Field, for duty.

Capt. Frederick C. Daniels to Jefferson Barracks, Mo., for duty.

—*Army and Navy Register, July 26.*

Maj. Samuel J. Randall to Fort Thomas, Ky., for duty.

Maj. Richard B. Clark to Walter Reed General Hospital, D. C., for duty.

The following to Philippine Islands for duty: Maj. Dale E. Repp, Capt. Robert Larkin Lowry, First Lieut. William Henry Siefert.

Capt. Arthur G. Buehler to Fox Hills, N. Y., general hospital 41, for duty.

—*Army and Navy Register, August 2.*

Lieut. Col. C. W. Lewis, to central department for duty.

Lieut. Col. R. W. Pearson, to Camp Gordon.

Capt. Raymond F. Mulcahy, to hospital No. 21, Denver, for further treatment.

Capt. Nathan C. Pickles, to Jefferson Barracks.

Capt. Lawrence K. Anderson, to Fort Benjamin Harrison.

—*Army and Navy Register, August 9.*

The following honorably discharged as colonels only, to take effect August 24; Cols. George H. Casaday, Robert F. Patterson and Rex H. Rhoades.

The following honorably discharged as lieutenant colonels only, to take effect August 24; Lieut. Cols. Charles W. Lewis, Raymond W. Pearson and Arthur J. Skillman.

Maj. Richard K. Thompson honorably discharged as major only, to take effect August 24.

—*Army and Navy Register, August 16.*

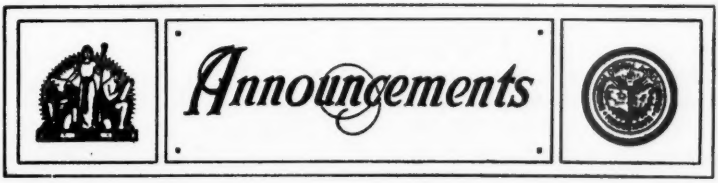
Lieut. Col. Minot E. Scott to Canal Zone for duty as department dental surgeon.

Maj. Elbert E. Rushing to Camp Funston, Kans., for duty.

Capt. Roy R. Newman to Bellville, Ill., Scott Field, for duty.

Capt. Daniel Bratton, Hampton, Va., general hospital 43 for duty.

—*Army and Navy Register, August 23.*



NATIONAL SOCIETIES, 1919.

October.

20-24—New Orleans, National Dental Association.

20-24—New Orleans, National Association of Dental Faculties.

18-20—New Orleans, National Association of Dental Examiners.

20—New Orleans, Delta Sigma Delta.

20-24—New Orleans, Xi Psi Phi Fraternity.

20-24—New Orleans, Association of Military Dental Surgeons.

17-18—New Orleans, International Society of Prosthetists.

20-24—New Orleans, Psi Omega Fraternity. Grand Chapter meeting and National Alumni Chapter meeting.

21-23—New Orleans, The American Society of Exodontists.

20-24—Conference of dentists operating in school dental dispensaries.

STATE SOCIETIES.

October.

21—Louisiana, New Orleans.

Rhode Island, Providence.

November.

3-4-5-6-7-8—Arizona, Phoenix.

December.

2-3-4—Ohio.

PSI OMEGA FRATERNITY.

Psi Omegas should be especially interested in this year's N. D. A. meeting in New Orleans the week of October 20th for the trip there will not only enable them to attend a splendid dental convention amid charming surroundings, but to also visit the triennial Grand Chapter meeting of the fraternity, which immediately precedes that of the National Dental Association.

The annual session of the National Alumni Chapter will be held on Monday.

The undergraduate and alumni chapter delegates, together with all other visiting Psi Omegas, will be banqueted on Monday night by the New Orleans members, who have also provided other forms of entertainment and sightseeing, at times not to conflict with the N. D. A. program.

Hotel Grunewald will be fraternity headquarters.

Additional information may be obtained from Dr. H. E. Friesell, Supreme Counselor, 1206 Highland Bldg., Pittsburgh, Pa., or Dr. Wallace Wood, Jr., Grand Master National Alumni Chapter, New Orleans, La.

Early reports indicate a large attendance. M. M. PRINTZ, Chicago, Ill.

XI PSI PHI FRATERNITY

The biennial meeting of the Supreme Chapter XI PSI PHI FRATERNITY will be held Friday and Saturday October 17th and 18th at the Grunewald Hotel. Officers and delegates must be present for roll call Friday 9 A. M.

The National Alumni Association will hold its annual meeting Monday, October 20th, Grunewald Hotel.

The annual banquet will be held Mon-

day, October 20th, 7 P. M., Grunewald Hotel.

Headquarters at the Grunewald Hotel will be maintained thruout the National meeting and members of the fraternity are requested to register upon arrival.

H. B. PINNEY,
Supreme Sec'y-Treas.,
25 E. Washington St., Chicago, Ill.

DELTA SIGMA DELTA FRATERNITY.

The thirty-fifth annual meeting of the Supreme Chapter of Delta Sigma Delta Fraternity will be held in the Elks' new Lodge Hall (which is about three blocks from the headquarters of the Fraternity), New Orleans, La., on Monday, October 20, 1919, at 9 a. m.

The regular order of business will be pursued, including action on the proposed amendments to the Constitution and By-laws; to be followed by initiatory exercises in the afternoon.

Headquarters of the Fraternity will be in the Grunewald Hotel. The annual banquet will be held in the Elks' new Lodge Hall at 7 p. m. Those expecting to attend the banquet will greatly facilitate the work of the committee by making their presence known as early as possible on the day of the meeting.

By order of the Supreme Chapter.

R. HAMILL D. SWING,
Supreme Scribe.
CARL D. LUCAS,
Supreme Grand Master.

THE NATIONAL ASSOCIATION OF DENTAL LIBRARIANS.

The National Association of Dental Librarians will hold a meeting in New Orleans, October 20th, 1919, at the Grunewald Hotel.

All dentists interested in Dental Libraries are invited to attend.

A. F. ISHAM, D. D. S., President.
G. H. HENDERSON, L. D. S., D. D. S.,
Secretary-Treasurer.

ANNUAL MEETING OF THE AMERICAN ACADEMY OF PERIODONTOLOGY.

New Orleans, La., October 17-18, 1919.

The Sixth annual meeting of the American Academy of Periodontology will be held at New Orleans, October 17-18, 1919.

Council meeting the afternoon of Thursday, October 16, 3 P. M.

First session of the Academy Friday, October 17th, 10 A. M.

Final session Saturday, October 18th, 7 P. M.

The Academy to present to the National Dental Association a report covering recommendations on the technic of the Personal Care of the Mouth.

The work of the Academy for this year to consist of a symposium covering all phases in the treatment of Dental Periclasia, brought out by papers, illustrated by clinics and backed by reports on Scientific Investigation and Office Treatment by the Academy's committees under those titles.

All meetings of the Council and session of the Academy to occur in the Convention Hall, twelfth floor of Hotel Grunewald.

All dentists interested in Periodontia will be welcomed.

GRACE ROGERS SPAULDING,
Sec'y, Detroit, Mich.

ANNUAL MEETING OF NATIONAL ASSOCIATION OF DENTAL FACULTIES.

The annual meeting of the National Association of Dental Faculties will be held in Parlor E, Mezzanine Floor, The Grunewald Hotel, New Orleans.

The meeting will be called on Saturday, October 18, at 9 a. m., and will last thru Monday.

Very respectfully,
C. C. ALLEN, Secretary.

VANDERBILT UNIVERSITY SCHOOL OF DENTISTRY.

To the Editor of The Journal of the National Dental Association:

Regarding the notice in the last issue of The Journal, I wish to advise you that the School of Dentistry of Vanderbilt University has been reorganized, and plans have been perfected by which the School will continue without interruption. The next regular session will begin September 30th, 1919.

Yours very truly,
R. BOYD BOGLE, M. D., D. D. S.,
Dean.

STATE OF ILLINOIS, LAW DEPARTMENT SPRINGFIELD.

Edward J. Brundage, Attorney General.

July 24, 1919.

Dentists:

Mr. Francis W. Shepardson,
Director, Department of Registration and Education,
Springfield, Illinois.

Dear Sir:

I have your letter of July 8, in which you call my attention to the repeal of section 14 of "An Act to regulate the practice of dental surgery and dentistry in the State of Illinois and to repeal certain acts therein named," by the provisions of House Bill No. 541, which was passed by the 51st General Assembly and which became a law without the Governor's signature, and desire to know the status of the licensed dentists who on July 1, 1919, had not paid the biennial renewal fee of $1, which was due November 1, 1917, and whose licenses were cancelled for failure to secure the renewal certificate within a period of six months after November 1, 1917, and who had not paid the restoration fee of $20.

In reply I beg to state that it is my opinion that a licensed dentist who on July 1, 1919, had not paid the biennial renewal fee of $1 which was due on November 1, 1917, and whose license had been cancelled for failure to renew his certificate within six months after November 1, 1917, and who had not paid the restoration fee of $20, is now without authority to practice dentistry.

Very truly yours,
(Signed) EDWARD J. BRUNDAGE,
Attorney General.

STATE OF ILLINOIS DEPARTMENT OF REGISTRATION AND EDUCATION.

Springfield, August 11, 1919.

Editor The Journal of the National Dental Association,
127 North Dearborn Street,
Chicago, Ill.

Dear Sir:

The last General Assembly of the State of Illinois repealed the section of the Dental Law requiring the biennial renewal of dental licenses and also providing a way to restore licenses which had been cancelled for failure to pay the renewal fee within the time required by law.

I am enclosing herewith a copy of the opinion of the Attorney General of Illinois as to the effect of this repeal. You will observe that all persons who hold dental licenses and who were not in good standing July 1, 1919, are without authority of law to practice dentistry in Illinois. Inasmuch as the section which provided the manner in which licenses might be restored was repealed, there is now no way to be restored as a licensed dentist except by filing formal application and passing an examination.

The Department most respectfully requests that you publish the enclosed opinion of the Attorney General in your next issue, with such additional information as you may desire.

Yours respectfully,
F. C. DODDS,
Superintendent of Registration.

NORTHERN ILLINOIS DENTAL MEETING.

The thirty-second annual meeting of the Northern Illinois Dental Society will be held at Rockford, Illinois, on Wednesday and Thursday, October 8th and 9th. A cordial invitation is extended to practitioners of dentistry.

R. P. CULVER, Sec'y.
DeKalb, Illinois.

IOWA STATE DENTAL BOARD.

The Iowa State Board of Dental Examiners will meet for the purpose of examining candidates for license to practice in Iowa, at Iowa City, College of Dentistry, beginning Monday, October 6th, 1919, at 9 A. M.

For further information and blanks, address

DR. C. B. MILLER, Secy.,
605 Cit. Nat'l Bank Bldg.,
Des Moines, Iowa.

BOARD OF REGISTRATION IN DENTISTRY.

The regular semi-annual meeting of the Rhode Island Board of Registration in Dentistry for the examination of applicants will be held in the State-house, R. I., November 4, 5, 6, 1919. All applications with proper fee must be filed one week previous. For further information address,

E. A. CHARBONNEL, Sec'y,
334 Westminster St., Providence, R. I.

MISSOURI DENTAL BOARD.

The next meeting of the Missouri Dental Board for examining applicants will be held at the St. Louis University Dental Department, St. Louis, Mo., Tuesday, Wednesday and Thursday, October 14, 15 and 16, 1919.

Examinations beginning at 8 A. M. each morning. Applications and fee must be in the hands of the Secretary at least ten days before examination.

V. R. McCUE, Secretary,
Cameron, Mo.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their regular examination in the State House, Trenton, N. J., Decembe 1st to 5th. License fee, $26, re-examination fee, $10.

Practical tests required: Insertion of an approximal gold filling with approximating tooth in position, compound approximal amalgam filling, a silicate filling, practical test of applicant's ability in oral prophylaxis, and preparation of cavity for an inlay with wax pattern. Taking of impression; bite; selection of tooth, articulation, trial plate. Soldering of Richmond crown, which must be made from an impression of the mouth, and the articulating model with the crown, when soldered, must be submitted for inspection. A practical examination in Mouth Diagnosis will be required.

Attention is directed to the following quotation from the dental law of New Jersey.

"Applicant shall present to said Board a certificate from the Commissioner of Education of this State, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study, or the equivalent thereof." In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the Commissioner of Education, State House, Trenton, N. J.

Applications must be filed complete ten days before the date of the examinations. Address all communications for further particulars to the secretary.

JOHN C. FORSYTH,
435 E. State St., Trenton, N. J.

STATE OF IDAHO, DEPARTMENT OF LAW ENFORCEMENT.

Boise, August 7, 1919.

Dear Dr. King:

You will find enclosed herewith a list of those granted licenses by the Department of Law Enforcement in the July examination.

Twenty men applied and twelve were granted licenses to practice dentistry.

This is the first examination held by this department and these are the first licenses issued by us.

If in the future this department can render you any assistance in any way please advise.

Respectfully yours,

ROBERT O. JONES,

Commissioner on Law Enforcement.

List of those granted licenses to Practice Dentistry in Idaho, by the Department of Law Enforcement, July 8th, 9th, 10th and 11th:

W. L. Wylie, Polo, Missouri.
Marvin Gould, Boise, Idaho.
Percy G. Flack, Boise, Idaho.
Adolph Nathaniel Pearson, Troy, Idaho.
Joseph Alonzo Knox, Bozeman, Mont.
Geo. H. Grover, St. Anthony, Idaho.
Vern. R. Greenwood, Richfield, Utah.
Wm. B. Walker, Idaho Falls, Idaho.
Paul E. Dutton, Portland, Oregon.
Henry Leonard Holter, Spokane, Wash.
Fred L. Edele, Portland, Oregon.
Earl Walton Udick, Caldwell, Idaho.

PRELIMINARY PROGRAM

For the Sixth Annual Meeting of the American Academy of Periodontology.

New Orleans, La., October 17th and 18th, 1919, Hotel Grunewald.

Friday, Oct. 17, 1919—Morning Session.

10:00 A. M.—President's Address, Reports of Officers, Reports of Standing Committees.

11:00 A. M.—Report of Committee on Nomenclature and Scientific Research, the Etiological Factors of Periodontoclasia—Arthur H. Merritt, New York City.

11:30 A. M.—Reports by the Committee on Personal Care of the Mouth and Office Treatment—Gillette Hayden, Columbus.

(1) The Tooth Brush and Methods of Cleaning the Teeth.

(2) Procedures in the Treatment of Suppurative Periodontoclasia with Considerations of Points in Diagnosis, Treatment and Prognosis.

Afternoon Session.

2:30 P. M.—Unfinished business, new business.

3:00 P. M.—Essay (subject to be announced later)—John Oppie McCall, Buffalo.

3:30 P. M.—Symposium on Case Management:

C. M. Gearhart, Washington, D. C.
Elmer S. Best, Minneapolis.
Austin F. James, Chicago.
Paul R. Stillman, New York City.

Evening Session.

8:00 P. M.—Periodontal Histology, Harold K. Box, Toronto, Ont.

Saturday, October 18, 1919—Morning Session.

10:00 A. M.—Essay by well known dental writer—to be announced later.

11:00 A. M.—Business Session of Academy.

Afternoon Session.

2:30 P. M.—Clinics.

March of Treatment for Suppurative Periodontoclasia.

First Sitting.

Clinically determine roots hopeless or to be radiographed. Directions for home treatment. Chart roots (m) mobile, (l) loose and (w) wabbly.

Second Sitting.

Dr. Jules J. Sarrazin, New Orleans.

Local Radiography and Clinical Diagnosis. Systemic Diagnosis and Directions. Vitality Tests.

Third Sitting.

Dr. Austin F. James, Chicago.
Scaling.

Fourth Sitting.

Dr. R. R. Johnston, Pittsburgh.
Scaling (completed) and Polishing.

Fifth Sitting.

Dr. Paul R. Stillman, New York City.
Correcting Traumatic Occlusion, or Disoccluding where needed.

Sixth Sitting.

Correcting Traumatic Occlusion, or Disoccluding (completed).

Seventh and Subsequent Sittings.

Curetting roots and sockets thoroly. After-treatment. Exceptional TEMPORARY splinting and technic for home care. Prophylactic treatment repeated at intervals.

Evening Session.

7:00 P. M.—Galatoire's Restaurant; dinner; report of Council; reading minutes of present meeting, election of officers.

All sessions of the Academy and of its Council except the Saturday evening session will be held in the Convention Hall, twelfth floor, Hotel Grunewald.

On Sunday, October 19, at 11:00 A. M. there will be a pleasure ride over the city and Lake Ponchartrain.

JULES J. SARRAZIN, President,
New Orleans, La., 424 Godchaux Bldg.
GRACE ROGERS SPALDING,
Secretary-Treasurer,
Detroit, Mich., 803 Empire Bldg.

BACK COPIES OF 1918 JOURNAL.

Several of the medical and dental libraries need extra copies of the 1918 Journal. This volume will be bound and placed on the shelves of the library for reference work. Therefore, if our readers who do not intend to bind this volume will send it to us, by express, collect, we will appreciate it.

DR. OTTO U. KING, Sec'y,
National Dental Association,
127 No. Dearborn St., Chicago, Ill.

BOOKS AND JOURNALS WANTED FOR A NATIONAL DENTAL ASSOCIATION LIBRARY.

The Association is gathering material for a great national dental library. We need your assistance. Send us the following items: Dental text books, old or new; dental journals, college year books, college announcements, State Board dental reports, State Dental Society bulletins and programmes, State Board reports, photographs, engravings or prints of dentists; any print or picture relating to the practice of dentistry.

If the shipment weighs under fifty pounds send it by express, collect. If over that amount before sending please ask for shipping directions.

Address: The National Dental Association, 127 No. Dearborn St., Chicago, Illinois.

SEND MARCH, 1919, JOURNAL TO THE NATIONAL OFFICE.

The National Dental Association needs about 300 copies of the March, 1919, Journal to supply libraries and members of the profession who expect to bind Vol. No. VI. If you do not expect to preserve your files, kindly mail this number to the National office.—Dr. Otto U. King, 127 No. Dearborn St., 1017 Unity Bldg., Chicago, Ill.